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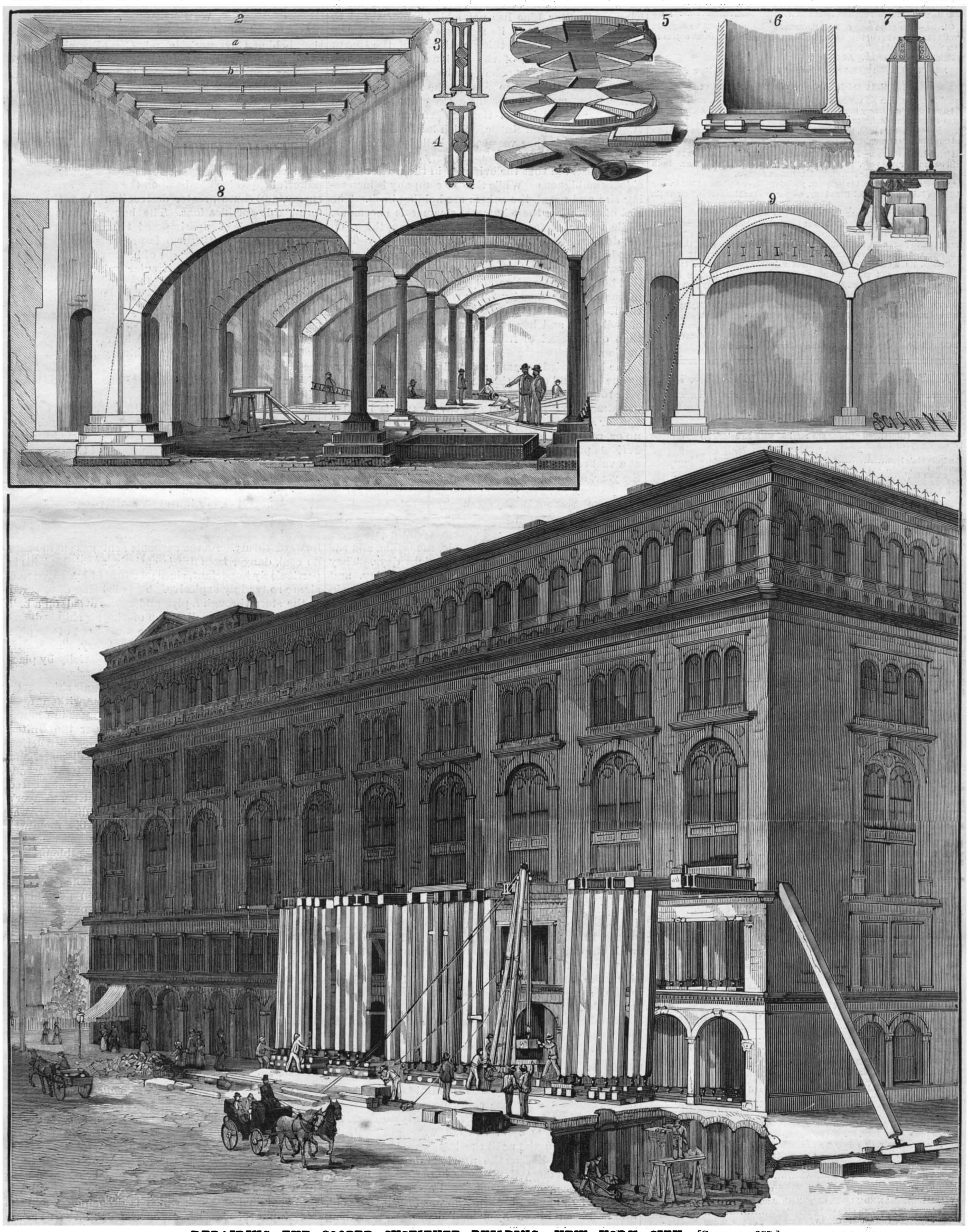

REPAIRING THE COOPER INSTITUTE BUILDING, NEW YORK CITY.—[See page 357.]

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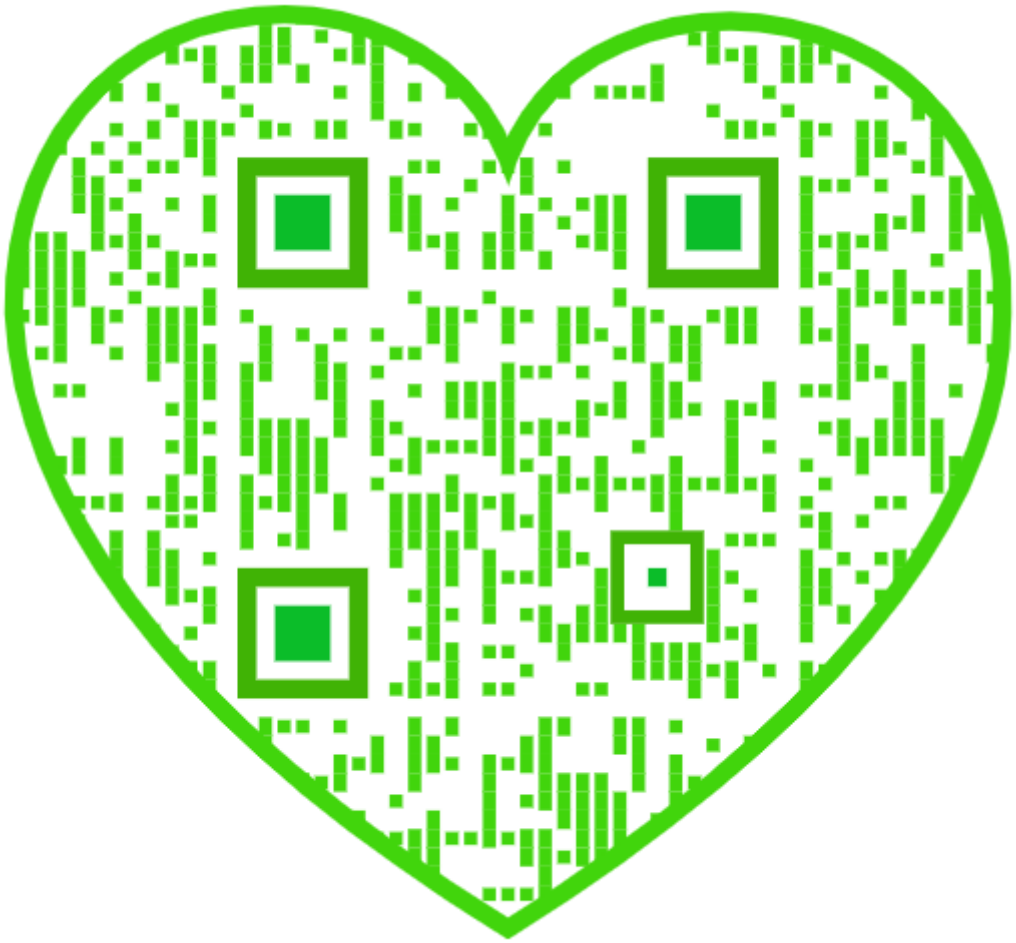

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NEW YORK, SATURDAY, DECEMBER 5, 1885.

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THE GREYHOUNDS OF THE ATLANTIC.

It is a question whether the new class of steamships of extreme speed and enormous size can be made as acceptable to their owners as to the public, for the large expense for first cost and maintenance makes it doubtful on which side the financial margin will be found. The managers of the Cunard Line seem, however, to have satisfied themselves of their profitableness, for within the past few years they have added to their fleet as many as five of the fastest and largest vessels afloat. The French Steamship Company are following the same policy, and the voyage from New York to Havre will be made next summer by the large new steamers recently built for the purpose. The other lines, however, are more conservative. The White Star Line has not added a new vessel to its fleet for years, and its steamers can no longer be called swift. The same thing holds true of the Inman Line. The America, of the National Line, and the City of Rome, of the Anchor, are both known as ocean racers. The Guion Line retains the Alaska and the Arizona, but was glad to sell the Oregon to the Cunard Company; and it is said that the rumor of war between England and Russia, which led to the chartering of this and other vessels, was hailed with delight by those companies whose property was taken. It will be observed that the evidence in the matter is decidedly ambiguous. While the one company is increasing size and speed, the others are holding back. The cost of operating these immense steamers is enormous, while the rates for ocean travel are, if anything, on the decline. The great size made necessary by high speeds adds to the resistance while it increases the power, and the greater space occupied by engines and coal bunkers does not permit a corresponding increase in the carrying capacity. The cost of a steamer like the Etruria is about $1,000,000; she burns over 300 tons of coal daily, and her crew is necessarily much larger than on a vessel of from five to six thousand tons burden.

She has carried as many as 600 first class passengers at one trip, and could this rate be maintained all the year round, she would, of course, be a very profitable investment; but the season of heavy travel is limited, and for a large part of the year she must either be laid up or run at a loss. The real question, then, as the *Tribune* puts it, is whether it will pay to build vessels at a vast cost which will run almost empty during half the year, and will make the passage from New York to Queenstown in twenty-fours less time than other vessels which cost much less and burn half as much coal. In the long run, it will probably be found that the most profitable steamers for transatlantic passenger service are boats like the Britannic, the Gallia, and the Normandie, which cross in about eight days. They burn something less than 200 tons of coal a day, and can accommodate about 300 passengers. The gain of the larger and swifter boats in capacity and speed is at too great a cost.

M. PASTEUR'S RESEARCHES IN THE TREATMENT OF HYDROPHOBIA.

The entire civilized world has for some time past been watching with intense interest the experiments on the treatment of hydrophobia conducted by the celebrated French scientist, Dr. Louis Pasteur. These researches have now been so far completed that the results have been presented by the investigator to the French Academy of Sciences. The first step in these investigations, as reported by cable to the *Herald*, was the inoculation of a rabbit with a fragment of tissue taken from the spine of a rabid dog. The incubation of the poison occupied fifteen days. As soon as the animal died, a portion of its spinal marrow was in turn inoculated into a second rabbit, and the process continued until sixty rabbits had been treated. Each inoculation increased the power of the virus, so that the last incubation occupied but seven days. As dried air diminishes the power of the virus, the spinal marrow of the inoculated rabbits was kept in bottles of dried air. In beginning his experiments, therefore, M. Pasteur inoculated his subject with the old tissue, and finished the operation by the injection of tissue that had been bottled only two days, the period of incubation of which would not exceed a week. These experiments have been very successful, for after such an inoculation the subject is found to be entirely proof against hydrophobia. An excellent opportunity to test the new treatment was afforded by a lad, twelve years old, named Meister, who had been bitten fourteen times by a rabid dog, and who was brought to M. Pasteur. As there seemed no doubt of a speedy and painful death, should nothing be done for the child, he was considered a proper subject for experiment. In thirteen days, the inoculations made upon the lad were gradually increased in strength, until the last was from a rabbit that had only died on the previous day. At the end of a hundred days, the lad was in perfect health, and the experiment was pronounced a decided success. Another lad, named Judith, who was fifteen years old, and had been bitten by a mad dog, was progressing satisfactorily after a week's treatment, and a fortnight from the time of the accident. To carry this system into effect, it will be necessary to have rabbit farms established, where the animals will be kept constantly inoculated with the disease, just as we now have bovine farms for the production of vaccine virus. Two lines of treatment are mentioned, the inoculation of human subjects and the blotting out of the disease by the compulsory inoculation of dogs for several generations. The origin and nature of hydrophobia are understood but imperfectly, and it is too soon to make any definite assertions in regard to M. Pasteur's system. It is probably but the first link in a chain of elaborate investigation. The honor, however, in such unique inquiries is to him who breaks the ground.

WAR BALLOONS.

At a recent meeting of the Military Service Institution, held at Governor's Island, Gen. Russell Thayer, of Philadelphia, presented in detail his system of independent and dependent dirigible balloons, intended particularly for use in war times. General Thayer has made many experiments in aerial navigation, and has so far been successful that a number of his designs and working models are now under consideration at the British War Office.

The independent balloon is for observation chiefly, and has sufficient carrying force to enable it to drop powerful explosive bombs upon the fleet or camp of an enemy, and cause greater destruction than the most formidable fortifications. The buoyant part of the balloon is made of superimposed tissues of silk or rubber, or vegetable textures impregnated with caoutchouc, to prevent the escape of hydrogen.

The form is that of a circular spindle, the longer horizontal axis of which should be three and two-thirds that of the smaller. The body is at all times perfectly inflated, so as to remain rigidly in shape. The suspended deck, carrying the machinery and crew, is firmly supported and braced. A lower deck carries the motive power. When the machinery is in operation, the balloon can be raised or lowered to any elevation without employment of ballast. Four cylinders located on the upper deck receive a portion of the hydrogen from the inflated bag of the balloon when it is desired to lessen its buoyancy, and consequently descend. To ascend, the gas is pumped from the cylinders into the bag, and by displacing the heavier air of the surrounding atmosphere, the buoyancy is increased.

The motor is a high pressure air compressor coupled directly to a newly devised carbonic acid gas engine and a reservoir for storing the air until sufficient pressure is obtained. At given intervals of time, the compressed air is suddenly released, producing a powerful forward thrust. As the carbonic acid gas engine uses no coal, danger from fire is entirely avoided. This is particularly important, since mixtures of hydrogen and air are so terribly explosive. The air being discharged at the stern through a pipe and nozzle fitted on a ball and socket joint, the direction of the air ship is determined by a wheel governing the movement of the pipe and nozzle. No other rudder is necessary. The efficiency of the mechanism is increased materially by placing hollow, truncated cones over the nozzle.

Gen. Thayer expressed his belief that air ships, even 1,000 yards in length, could be operated without difficulty, since the resistance does not increase in proportion to the size of the ship. Last year the United States Ordnance Board recommended the construction of an experimental balloon, 100 feet in diameter and 367 feet long. Such a ship would have a total ascending force of about 55 tons. It is thought that a speed of 50 miles an hour could be obtained. Gen. Thayer's model, being 30 feet long by 10 feet in diameter, was not placed on exhibition, as the assembly room was scarcely capacious enough.

The construction of the dependent dirigible balloon is similar to that of the independent ship except the motive power, which is here electricity. The track consists of two parallel wires supported on poles above the ground. The lower deck would be provided with two large wheels constructed to run on the under side of the wires, and two small wheels to run on the upper side. This arrangement anchors the balloon to the earth, and furnishes the motive current from a dynamo at the end of the line.

It is expected that a speed of at least 20 miles an hour could be obtained. A model of the balloon and track was shown, and by making the connection was operated successfully. These experiments have attracted much interest, and have inspired a confidence in their ultimate success when put into practice.

ACCORDING to *La Lumiere Electrique* Mr. L. Senet has invented a new process that permits of the manufacture of aluminum, as well as copper, silver, etc., by electrolysis. A current of from 6 to 7 volts and 4 amperes is made to act upon a saturated solution of sulphate of aluminum in the presence of a solution of chloride of sodium, the two solutions being separated by a porous vessel. A double chloride of aluminum and sodium is formed, which is decomposed, and the aluminum that is set free deposits upon the negative electrode.

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NIGHT SKY—NOVEMBER AND DECEMBER.

BY RICHARD A. PROCTOR.

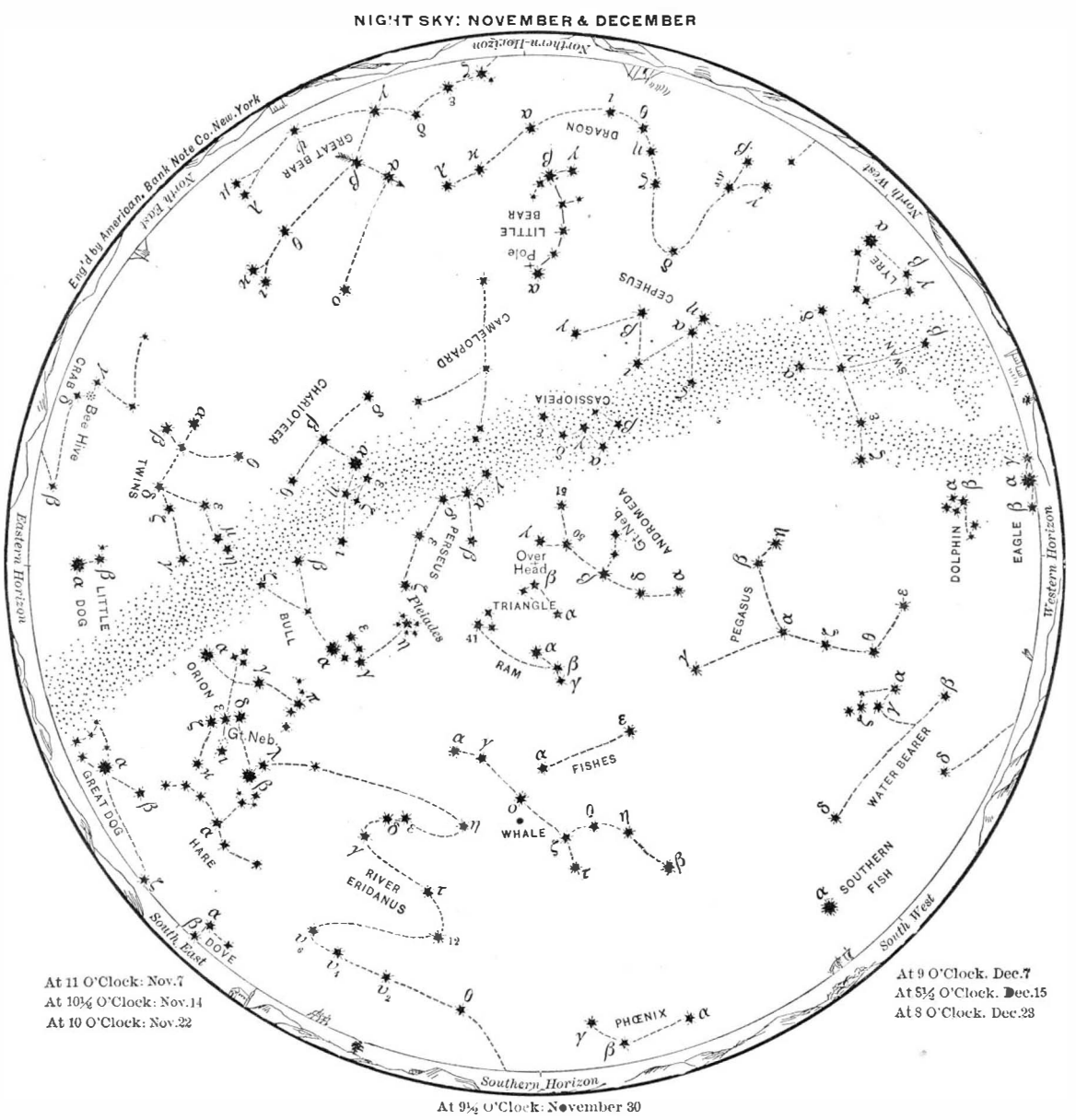
The Great Bear (*Ursa Major*) is beginning to rise above the northeast (by north) horizon. The end of the Dipper's handle is hidden. A line from the Pole Star (toward which the Pointers direct the observer) to the Guardians of the pole, β and γ of the Little Bear (*Ursa Minor*), is now in the position of the minute hand of a clock 27 minutes before an hour. The stars of the Dragon wind round below the Little Bear toward the west, the head of the Dragon with the gleaming eyes ("oblique retorted that askant cast gleaming fire") being low down, a little north of northwest. Above is King Cepheus, and above him his queen, the Seated Lady, *Cassiopeia*, their daughter, the Chained Lady *Andromeda*, being nearly overhead.

Low down in the northwest we see the Lyre (*Lyra*), with the bright Vega, and close by toward the west the Swan (*Cygnus*), or Northern Cross. The Eagle is setting in the west, and the Little Dolphin nears the western horizon.

Toward the southwest (by west) we see the Water Bearer (*Aquarius*), with his pitcher (β, γ, α), close by which is the head of the Winged Horse (*Pegasus*). In the south, low down, is the absurd Phœnix; above, the Sea Monster, or Whale (*Cetus*); above him, the Fishes (*Pisces*); above them the Ram (*Aries*); while nearly overhead lies the Triangle.

The river *Eridanus* occupies the southeasterly sky, the Dove and Great Dog (*Columba* and *Canis Major*) rising in the southeast. The glorious Orion has now come well into position, though not yet so upright as we could wish a knightly hunter to be. He treads on the Hare (*Lepus*), and faces the Bull (*Taurus*) above.

Due east we find the Crab (*Cancer*) and Little Dog (*Canis Minor*) low down; the Twins (*Gemini*) higher; above them the Charioteer (*Auriga*), with the bright *Capella*, and *Perseus* the Rescuer nearing the point overhead. In the mid-space between Perseus, Auriga, and the two Bears we find the ridiculous constellation *Camelopardus*, or the Giraffe.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

Asphalted Jute.

According to the *Journal des Fabricants de Papier*, a material called asphalted jute is being largely employed in Germany for covering roofs, for isolating damp walls and floors, and for preventing bad odors from reaching apartments situated over stables, etc.

It consists of strong jute cloth coated with specially prepared asphaltum, and covered on each side with strong, asphaltum-coated paper. In order to obtain a very compact product, the whole is submitted to very strong pressure.

The material can be used on farms for making tight reservoirs, in the construction of bridges, and in many other cases where there is need of a material that is at once strong, impermeable, and cheap.

Hon. Thomas A. Hendricks.

It is with deep regret that we record the death of Hon. Thomas A. Hendricks, Vice-President of the United States. After a very brief illness, he expired at his residence in Indianapolis, on November 25th. For some time he had suffered from a slight paralysis of the left hand, and it is thought that his death was caused by instantaneous paralysis of both heart and brain. Mr. Hendricks was born in 1819, at Zanesville, Ohio; studied at Hanover College, and, after completing his law course, was admitted to the bar of Indiana. He was at different times a member of the Legislature and of Congress, the Commissioner of the General Land Office, a National Senator, Governor of Indiana, and was twice chosen to be Vice-President of the United States.

THE Seventy-six Canal Company of California are to build a branch canal at Tulare County, 18 miles long and 60 feet wide.

Whitening Walls.

The *Deutsche Bauzeitung* has lately commented upon the dangers resulting from the use of certain substances in whitening walls, as well as from the size and other compositions used in paper hanging, etc. From the fact that painters' brushes are injured by lime freshly slaked, they often mix with it organic substances, which are liable, it is considered, to cause infection. The same remarks are applied in a general way to paperhangers. These disadvantages can, it is said, be obviated by adding one-tenth of a pound of boric acid to each gallon of ordinary milk of lime. This addition has the advantage of preventing the appearance of stains when paper or size colors are applied to walls not sufficiently dry. In cases of disinfection it is necessary for special care to be exercised as to purity of the lime used.

Interesting to Architects and Builders.—Comfortable Homes.

For many years past the "Baltimore" has been one of the best known and most popular of the fireplace heaters in use. For heating houses of moderate size it possesses advantages in its economy of fuel, moderate first cost, healthfulness, and beauty of design and finish, that easily account for the large degree of public favor it has received. It was originally a distinctive Baltimore invention, from which it took its name; but its manufacturers, Messrs. B. C. Bibb & Son, of that city, have introduced various new features in its construction, whereby the fire can at all times be regulated with the least possible attention, for the maintaining of a uniform temperature, with a minimum consumption of coal, while the heater will not only warm the lower rooms of a house, but two and sometimes three chambers above. It is, in fact, a miniature furnace, put in the fireplace or chimney flue, the same as a grate, and is furnished with or without a mantel, especially made to harmonize with it in appearance, and thus add to the furnishing and decoration of a room. The chimney flue may be used as a conductor of heat to the rooms above, or a tin heat pipe may be run through the chimney to the registers in the upper rooms. These heaters are self-feeding, and require so little attention that those using them frequently keep their fires going through the whole season without once having to rebuild a fresh fire, while they have an illuminated front which gives the cheerful appearance of a low iron grate in a room, with none of the dust and dirt which are such serious drawbacks to an open grate fire. The grate is so arranged that the clinker can be removed without disturbing the fire, and an improved slide has been added by which the ashes can be dropped directly into a receptacle in the cellar if so desired.

The "Baltimore" heater is in such demand that a majority of new houses in Baltimore and Washington less than 25 ft. front are supplied with and entirely warmed by them.

Messrs. B. C. Bibb & Son, Nos. 39 and 41 Light St., Baltimore, Md., are the inventors, patentees, and manufacturers of these improved heaters, the above company being the pioneers in this line, having been thirty-four years in the business.

Ammonia and Alcohol in Snake Bite.

Writing to the *Medical Times* from the Delaware Water Gap, where poisonous snakes abound, Dr. J. B. Shaw says that he was called to see a child, aged 10, female. She was bitten by a copperhead on the foot, about one inch above the middle toes. He saw her in four hours from the time she was bitten. Her symptoms then were: Extreme prostration with nausea; respiration very slow; pulse weak; eyes fully dilated, with a wild look. The foot and leg were very much swollen and purple, and very painful.

He gave her 60 minims of spts. ammon. aromat. hypodermically, ordered one ounce of whisky every two hours, and a large poultice of bruised raw onions to be applied to the foot and to be renewed every hour. The whisky and onions were kept up until the child was well, which was on the third day.

The above has been his treatment for the last six years, and he has never lost a case; nor has he heard of a death from snake bite where the treatment has been carried out.

Unmagnetizable Steel.

Mr. J. T. Bottomley has made some experiments with a piece of steel made by Messrs. Moses Eadon & Sons, of Sheffield, under Hadfield's patent, containing 15 per cent of manganese. One side of the specimen has been polished, and shows that the steel is capable of taking a very high finish. The present specimen has a tensile strength of 45 tons to the square inch. To test it magnetically, the bar was first "touched" with steel magnets, but these had evidently no effect upon it. It was then placed between the poles of a powerful Ruhmkorff electro-magnet, excited by forty large tray Daniell cells arranged in fours for quantity, and ten in series. The bar was, however, still unaffected by the magnetism, as far as could be perceived by the hand. On testing it by a delicate magnetometer, however, it was found to show a slight trace of magnetism. The magnetization per gramme was found to be 0·013 C. G. S. (centimeter-gramme-second) units, whereas some specimens of steel show 50 to 100 C. G. S. units per gramme.

The Hartford Steam Boiler Inspection and Insurance Co.

An examination of the financial resources of the Hartford Steam Boiler Inspection and Insurance Co., made during the past summer by A. R. McGill, the Insurance Commissioner of Minnesota, and J. J. Brinkerhoff, the Examiner for Illinois, shows the condition of the company to be in every sense satisfactory. It had on the 10th of August, $527,194.55 of good interest-paying assets, and, aside from its capital stock of $250,000, but $172,561.53 of liabilities. The investments of the company have all proved to be excellent, and the management has shown rare skill and ability in keeping the losses down to a minimum. This is due largely to the company's thorough system of inspection, by which the expenses are limited in a large measure to the preventive department. An investigation by outside examiners was deemed advisable, on account of adverse reports circulated in the Northwest by an unscrupulous competitor, but the report now made public will completely silence such an unworthy attack.

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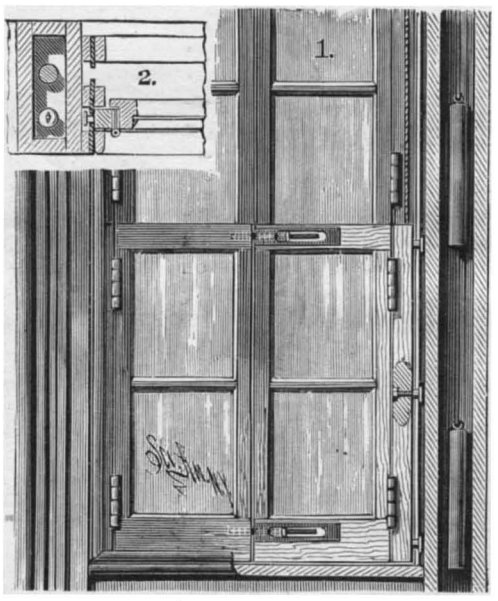
IMPROVED METHOD OF BURNING LIMESTONE.

We herewith illustrate an improved kiln for burning limestone, which, both in its construction and operation, possesses features that are new and of great value; but more important is the fact that the lime produced is of absolute purity. The stone during its passage down the kiln is subjected to the intense heat of hydrocarbon burners, and, the combustion being perfect, there is no opportunity for the introduction into the lime of any deleterious ingredient, such as sulphur; and as the stone from these quarries, which have been worked for over seventy years, is second to none in Pennsylvania in purity, the lime obtained is of the best quality. The white efflorescence often seen disfiguring the walls of buildings is in some cases caused by carbonate and sulphate of soda and potash; General Gillmore, in his "Treatise on Limes, Hydraulic Cements, and Mortars," states that one source of these salts is, "beyond doubt, the hydraulic lime or cement used in the mortar, derived partly from the stone itself, and partly from the ashes of the fuel used in calcination." It will be seen that this method of burning is free from all danger arising from "the ashes of the fuel used;" and even if the limestone were of a poor quality, the hurtful elements would be eliminated in the burning.

Additional evidence is contained in a report by Mr. Wm. Trautwine, under the title of "Incrustations on Brick Walls," which gives the results of an investigation made by him into the cause of the defacing of the buildings in Philadelphia. He attributes the discolorations to the use of a lime in building composed of a large percentage of magnesia, and burned with wood and coal conjointly, or coal alone, the sulphur from the coal being very injurious to lime.

The kiln proper consists of an iron shell lined with fire brick; the upper part tapers off, and terminates in an ordinary stack passing through the roof of the building. As shown in the engraving, the kiln extends from the ground floor through the second and third. The burner openings—four in number—are made through the shell and lining at a convenient height above the second floor and at equal distances apart. In each opening is placed a hydrocarbon burner, similar in construction to the ordinary atomizer, and consisting of two small pipes arranged at right angles to each other, and with the outlet ends in close proximity to each other. The vertical pipe connects with an oil circle extending around the kiln just within or without the iron shell and below the floors of the burner openings. This circle is connected by a pipe with an auxiliary tank, rectangular in shape (shown in the center of the cut), which is supplied with oil—crude petroleum—from the main reservoir located in one end of the building. The oil flows by gravity from the reservoir to the auxiliary tank, which is at such an elevation that when full the oil surface is a few inches below the burner outlet. Each horizontal pipe of the burners is connected with a steam pipe encircling the kiln just below the burner openings, and supplied with steam by the boiler.

Immediately below the steam circle is another connected with it, which carries away water of condensation. Fed by the water tank, shown in the center of the picture, is a large pipe encircling the kiln above the burners. From this circle a smaller pipe leads to each opening, where it connects with a water back; from the outlet of each water back a pipe leads to a waste-water collector. By this means a constant circulation of cool water is maintained through each water back, and the brick lining adjacent to the flame is protected from the effect of the intense heat. Suitably located valves control the admission of steam and the flow of oil and water to the kiln. The steam, in its passage across the opening in the vertical oil pipe of



BUCKNER'S IMPROVED WINDOW.

the burner, draws up the oil, which enters the kiln as a fine spray; upon being ignited, an intense and equal heat is obtained, which burns the limestone as it gradually passes downward through the kiln.

Limestone from the quarry, but a short distance away, is brought upon cars to the level of the upper floor; from here it is fed to the kiln through a door in the upper conical portion. The degree of heat to which the lime in its passage is submitted increases as the burners are approached. Above each burner opening is a peep hole, through which the condition of the interior may be observed. The lower part of the interior of the kiln tapers downward, and terminates in a chute, provided with a weighted door, and through which the lime is drawn. The lime is stored upon this floor, or packed ready for shipping; a track leading to one of the branches of the Pennsylvania Railroad passes before the door of this apartment. The lower portion of the kiln could, if thought desirable, be so constructed as to form a capacious storage chamber, in which the lime would be perfectly protected, and from which it could be easily drawn as needed.

From the above brief description it will be seen that all the parts are simple, the heat may be regulated to a nicety and may be maintained for an indefinite period, and that the kiln is continuous in its action. The limestone is subjected to what may be termed a cleansing process, and the lime is delivered in a pure state.

This invention has been patented by Mr. Joshua Hunt, and is controlled by the Baker Lime Co. (Limited), of Avondale, Chester Co., Pa., whose kiln our engraving illustrates. The general agents of the Baker Lime Co. are the Jackson Lime and Coal Co., of Wilmington, Del.

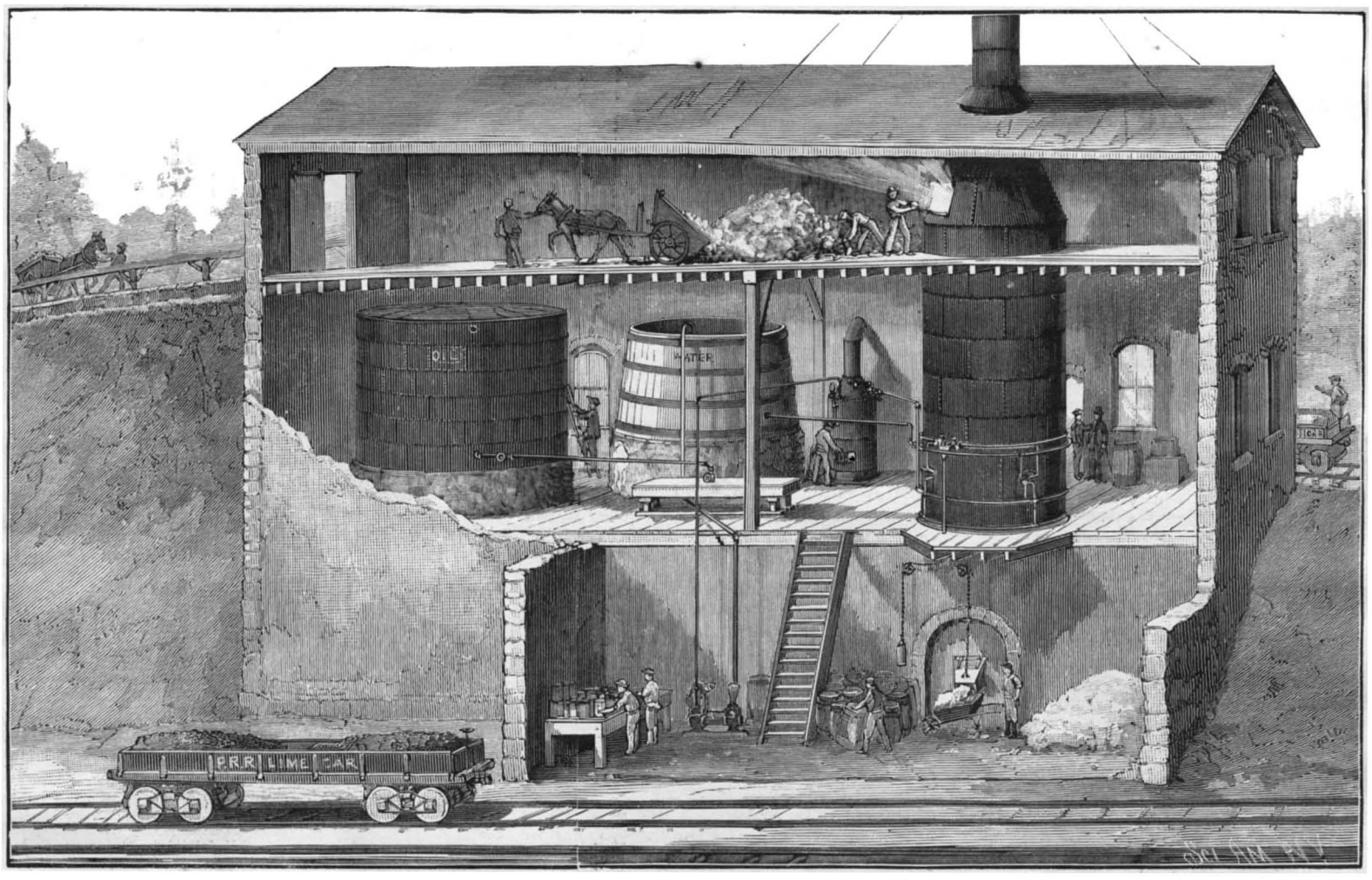
AN IMPROVED WINDOW.

To the window casing, which is formed with weight boxes in the ordinary manner, are attached guards forming grooves for the sashes to slide up and down in. Each of the sashes is made in two parts, rabbeted at their inner and outer edges to form close joints, and hinged at their outer edges to pieces fitted to slide up and down in the grooves in the casing. To each hinge piece are attached two or more bolts formed with flat heads, which project at the inner sides of the pieces so far as to underlap the adjacent edges of metal guide plates secured to and between the guards and casing, as clearly shown in the sectional plan view. When closed, the sashes are held together by bolts, as shown in the large view. With this construction the sashes can be raised and lowered with the same facility as ordinary sashes, and can also be swung open and shut upon the hinges, so that the outer sides of the window can be readily washed and the window can be fully opened in warm weather to admit air to cool and ventilate the apartment, and quickly closed when required.

This invention has been patented by Mr. M. S. Buckner, of 154 Hull Street, Savannah, Ga., who will furnish all further particulars.

Andromeda's Loss.

The new star in Andromeda, which was first seen by Ward, at Belfast, on August 19, as a star of the ninth magnitude, and two days later reached its greatest brightness as one of the seventh magnitude, is now fading at the rate of one magnitude in eighteen to twenty-one days, and has reached the lower brilliancy of a star of the eleventh magnitude. Monck has suggested the hypothesis that the stranger may be a dark star raised to incandescence by passing through the matter constituting the nebula, or may be a condensation of meteoric streams. Or it may not be in the nebula at all. If it is really passing through Andromeda, the length of its duration shows the enormous size of the nebula, since it must be going across the thin portion, the diameter of which is, nevertheless, forty or fifty times as great as the distance of the earth from the sun, or about four and a half billions of miles. Similar dark stars have been previously observed.



IMPROVED METHOD OF BURNING LIMESTONE.—KILN OF THE BAKER LIME CO

SOME one suggests the brilliant idea of chaining a Bible to each telephone in the country, so that while waiting for replies the telephoners will have something to read of a nature to repress profanity.

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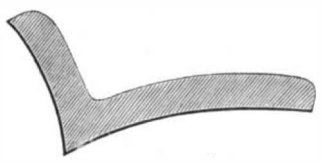
MACHINE FOR BEVELING ANGLE BARS, ETC.

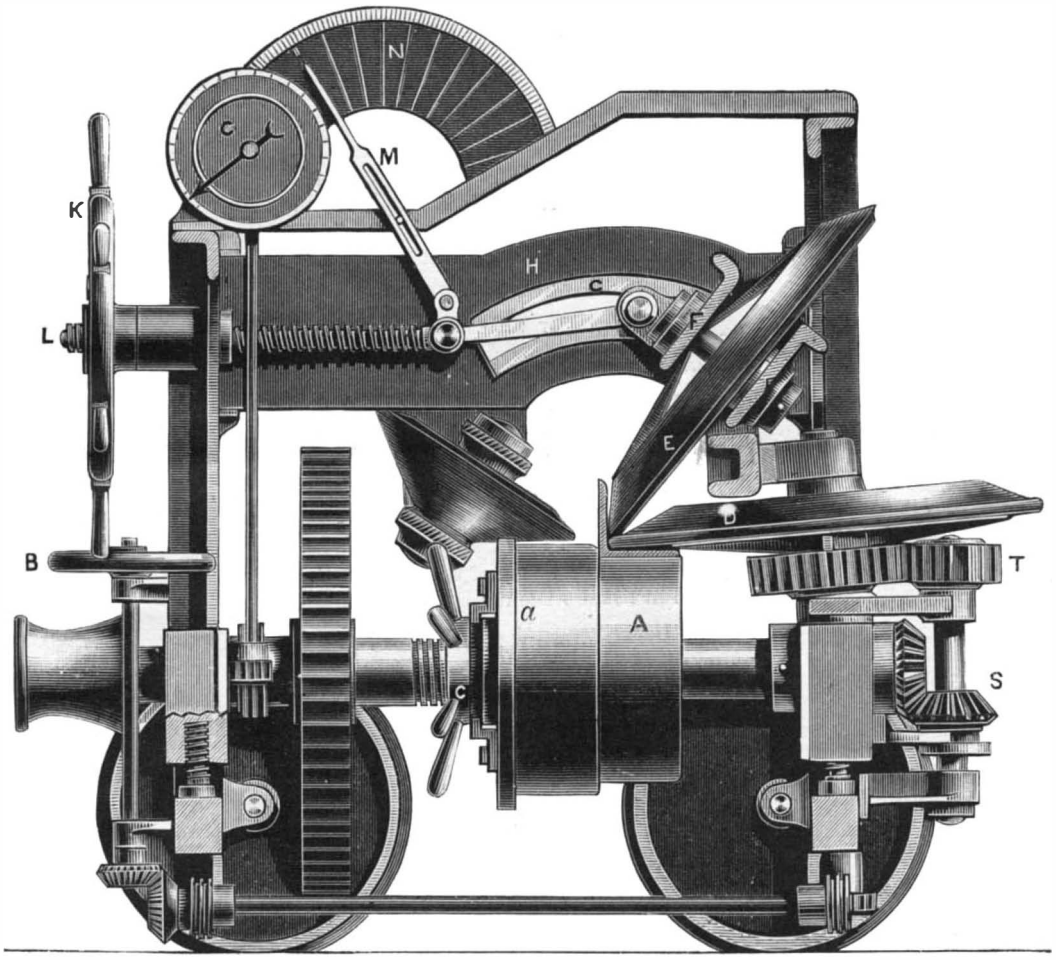
Any one practically acquainted with shipbuilding, boilermaking, etc., will be aware that up to a recent date it has been and is still generally customary to bevel bars for the frames, reverse bars, keelsons, stringers, etc., for iron or steel vessels in a very laborious manner, with the use of tools worked entirely by hand; the angle has in the first instance to be guessed at by the workmen, then altered back or forward until it conforms with the bevel obtained from the body plan of the ship. When the bevel required to be put on a bar, and the curve to which it has to be bent, is considerable, several heats are necessary, the iron in the process becoming brittle and unsatisfactory. Frequently the bar is broken and the labor at all events lost, as usually iron manufacturers only replace the material, and do not allow for the labor expended. In any case, the work when it is done by the ordinary method is far from being satisfactory, the bars becoming hollow in the flanges, thus–



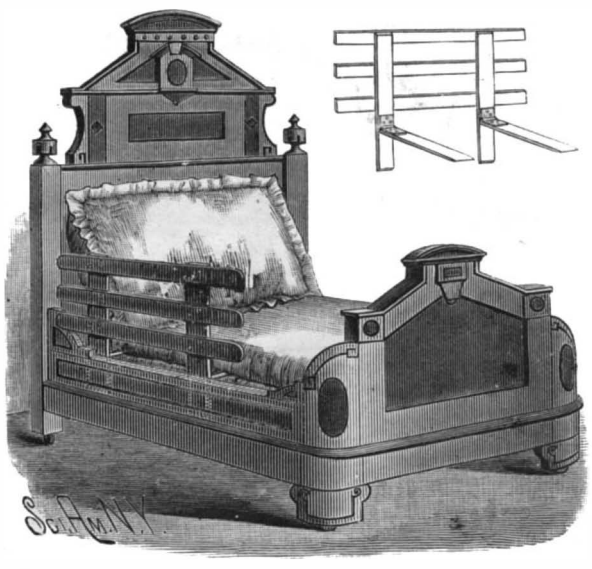
instead of being perfectly flat, so that, when the work is put together, the riveters are compelled to ply the bar with quarter hammers so that it may be made to fay close; and while doing so the bars are frequently fractured, which if detected leads to them being condemned, or doubling pieces have to be fitted as compensation. Arthur's patent beveling machine overcomes these practical difficulties to good beveling, and has already been tried, approved, and adopted by several large shipbuilding firms. The patentee is a practical iron shipbuilder, being at present a foreman plater with Messrs. Ramage & Ferguson, who have adopted the machine. The need of some better means of beveling angle and other bars has often occurred to Mr. Arthur, and this machine is the result of much thought and experiment on his part.

The machine which we saw at work was mounted on rails in front of the furnace, and when in use is brought up opposite the furnace mouth. It draws the bar out of the furnace (a saving of manual labor), and the beveling process goes on simultaneously while the bar is still at its best heat, no time being lost as in the ordinary method by having first to secure the bars on the blocks. It bevels straight out from the heel, and smooths down the rough edges of the rivet holes, so that the rivet head gets close up to the neck and the work fays close. The beveling is done correctly and at once, so that the result is smooth, clean, and accurate work; and the operation being done by rollers when the bar is hot, the edges are fair and free from local strains, which are always put on bars beveled by the old fashioned way, the beveling occupying just about the same time as in the ordinary method is taken in merely drawing the bar out of the furnace.

The bar when it has left the machine is sufficiently hot to be turned without reheating, and is easily wound or turned fair to the set, so that it is therefore free from kinks. It is claimed by the patentee that the work is done with a saving in labor alone equal to about 50 per cent, and there is no doubt that there is a very great saving in the labor expended in beveling. The machine is very compact, lightly but strongly constructed, and so simple that any workman can use it.



MACHINE FOR BEVELING ANGLE BARS, ETC.



McMURRAY'S SLEEPER'S GUARD.

The machine we saw in operation was being used to bevel 6 in. by 4 in. frame bars, and the frame turner using it was doing so for the first time, and had found practically no difficulty in understanding how to manipulate it, and expressed himself thoroughly satisfied that it did much better work than can be done by the old, crude method; and seeing the patentee was a perfect stranger to him, and he has no interest whatever in the machine, such an expression of opinion speaks for itself.

We append an illustration showing a sectional view of the machine, with part of the gearing and guide rollers removed, and with a bar in the position for open-beveling; when it is required to shut-bevel, the bar is fed through the machine with the horizontal flange in the opposite direction to that shown in the drawing, so that the edge will lie toward the collar, *a*, of the roller, A, and this roller is then adjusted horizontally to bear up on the edge of the bar. The most important parts of the machine are the conical rollers, D and E, of which the roller, D, holds one flange or wing of the angle bar horizontal, while the other roller, E, regulates the angle of the other wing of the bar. The angle is determined beforehand, and indicated by the pointer, M, on the sector, N, which is provided with a scale. The position of the roller, A, is adjusted by the hand wheel, B, and the screw collar, C, according to the thickness of the bar. By means of the collar, C, the roller, A, can be moved toward or from the conical roller, D; and by means of the hand wheel, B, the roller, A, can be adjusted vertically.

To regulate the angle of the bar, the screw, L, is turned, thus moving the summit of the cone, E, in the slot, G, formed in the cross-bar, H. The pointer, M, is connected at one end to the screw, L, and, as stated above, indicates on the sector, N, the angle formed by the two wings of the bar. This angle can be varied in different parts of the bar; and in this case the angles are taken on the plan of the ship at equal intervals in the length of the bar to be shaped. A disk, O, provided with a pointer indicates the course taken by the bar in passing through the machine. Note is taken in advance of the angles which correspond to each point of the bar, each of these points being designated by a number, and these numbers are placed on the disk, O. When the machine is to be operated, a bar is placed between the rollers, D and A, which revolve, and thus draw said bar into the machine. As the points which have been marked occur at regular intervals, it can easily be seen on the disk, O, when one of these points arrives at the rollers, at which moment the operator regulates the position of the roller, E, so that the pointer, M, will indicate on the sector, N, the angle corresponding to the desired angle of the bar at said point.

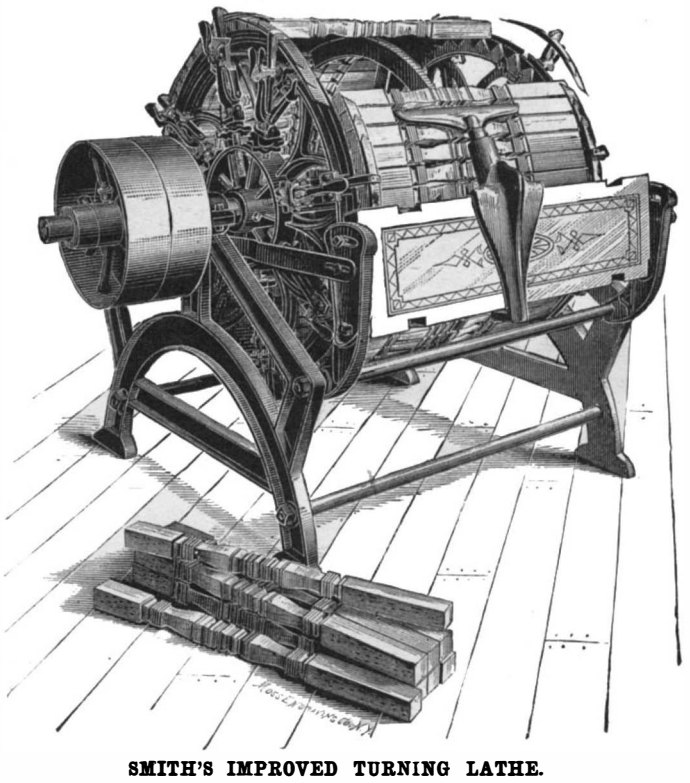
The machine draws the bar from the furnace when it has reached the desired temperature, and for this purpose guide rollers are provided, which are not shown in the cut.

THE SLEEPER'S GUARD.

One, two, or three horizontal slats are attached to two upright bars, which are intended to be placed between the edges of the mattress and the side pieces of the bedstead or berth. Two folding arms are hinged to these uprights at points considerably above their lower ends, and when in use are arranged to be placed between the two mattresses of the bed, or when only one mattress is used, between the mattress and the springs or slats. The guard is shown in our illustration as adjusted to an ordinary bedstead. When not in use, the arms may be folded against the uprights, as shown, and the guard is readily portable or may be disposed of during the day by putting it under the mattress. The invention has quite a wide application. It is intended for use with ordinary beds, or with the berths of sleeping cars and steamers, to prevent the occupant, and particularly children, from falling out and being injured or crippled. It is a very simple device, and when adjusted to the bed or berth, the sleeping persons are perfectly secure without recourse to pillows, chairs, or other uncertain contrivances. The guard has been patented by Mr. John C. McMurray, and is manufactured by the Sleeper's Guard Co., 277 Pearl St., New York.

AN IMPROVED TURNING LATHE.

This lathe, shown in the engraving, is designed to turn work square or polygonal in shape instead of round. The machine consists of two wheels adjustably secured upon a central shaft. The materials to be turned are placed upon the wheels, thereby forming a cylinder. The wheels being revolved, one side of the pieces are cut to the desired shape. They are then turned over, and the other sides cut in like manner. The pieces are held on the wheels by a series of clamps or shoes, which are adjustable radially to enable them to clamp materials of different thickness. Each clamp is worked by a lever, which is quick and powerful in operation. A single movement of the lever will throw the clamp back out of the way, as shown in the engraving, leaving a section of the machine free of all impediments, enabling the operator to place materials thereon or turn them over very rapidly; and when in place, a single movement of the lever will securely clamp them to the machine and lock the clamp so that it cannot be thrown back. The machine has an adjustable middle support for the pieces, upon which they are firmly held, preventing all vibration and per-



SMITH'S IMPROVED TURNING LATHE.

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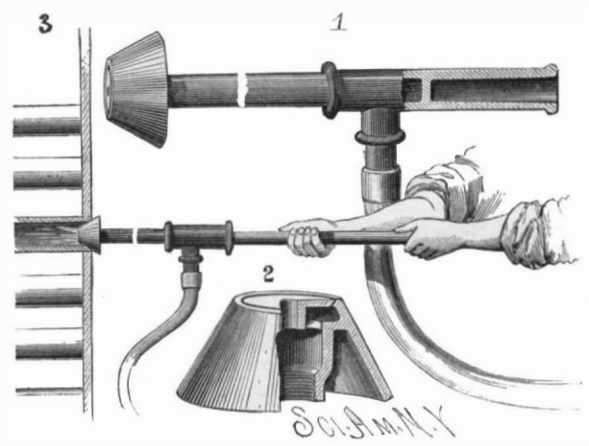
mitting of the finest work. The wheels are provided with adjustable seats, by means of which the pieces may be turned octagon or any other number of sides. The machine is so designed as to be easily and rapidly operated, and will finish smooth, with clean, sharp edges, from one hundred and fifty to six hundred pieces in ten hours.

This invention has been patented, and the machines are now manufactured by Messrs. D. C. & S. E. Smith, 227 West 5th Street, St. Paul, Minn.

BOILER FLUE CLEANER.

In the flue cleaner which we illustrate, the inventor has taken advantage of the cleansing power of a jet of dry steam, and has produced an instrument which is both effective and rapid in its operation. A truncated cone of cast iron, having the diameter of its base



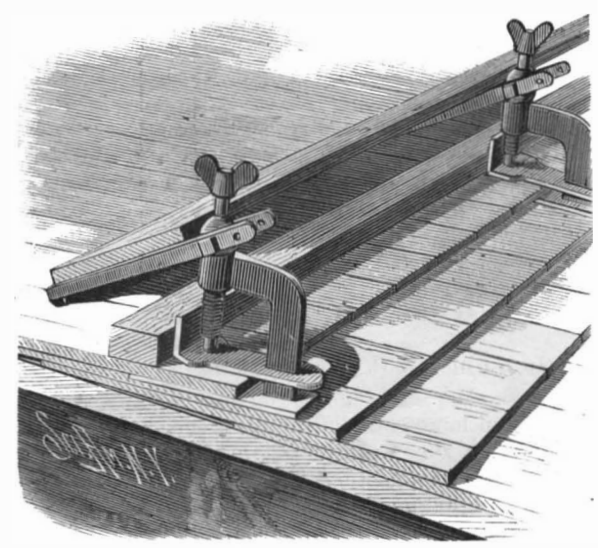
FERGUSON'S BOILER FLUE CLEANER.

somewhat greater than that of the flues to be cleaned, is screwed on the end of a section of tubing, which has a socket on its other end for the reception of a handle, and a right-angled neck for connection with a flexible steam pipe. This construction is shown in the first figure on a larger scale, and in the third figure as in actual operation. In the second figure, a portion of the truncated cone has been broken away, in order to disclose the internal arrangement. The neck of the conical nozzle is screw-threaded to make a tight joint with the tube section, and, by means of suitable braces, supports a disk at its face, provided with an annular opening and a central aperture for the discharge of the steam blast. The nozzle closes the mouth of the flue, excluding all air, and, by means of the openings in its disk, discharges a current of steam against the sides of the flue, sweeping out all obstructions and preventing the formation of scale. Where the cleaner is intended for use with an upright boiler, the handle may be arranged at right angles to the tube.

The device has been patented by Mr. J. M. Ferguson, 99 Camp Street, New Orleans, La., who will furnish further particulars.

CLAMP FOR ROOF SCAFFOLDS, ETC.

Attached to a plate which can be inserted under one of the shingles, as shown in the engraving, is an arm carrying a clamping screw having a bearing plate attached to its lower end. The bearing plate is slotted to receive the arm, and when borne down by the screw it serves to securely clamp the shingle between it and the lower plate. The upper end of the bearing plate is formed with a toe or upright, against which and



BARLOW'S CLAMP FOR ROOF SCAFFOLDS, ETC.

the corresponding toe of an adjacent clamp a "straight edge" may be placed when shingling the roof, to provide for laying the shingles perfectly true without the aid of a chalk line or any other guide. On each screw above the arm is a ball, to which is pivoted a support for the plank. This support consists of a bar slotted at one end where pivoted to the ball, and provided on the under side of its opposite end with any number of small pointed projections to stick into the roof to assist in holding the clamp in place. The clamps may be quickly and easily shifted from time to time to adjust them to different positions on the roof as the work progresses. It is claimed that one man by the aid of this device can lay 5,000 shingles a day, and that its use will result in a great saving of time and money. It can be used in laying tin or slate roofs, and by painters or tinners, and by farmers or others in repairing roofs. It does away with lumber for scaffolding and the labor of nailing the same. The clamp can be used in all kinds of weather, and would prove useful in case of fire in ascending the roof.

This invention has been patented by Mr. A. T. Barlow, of Marshfield, Oregon; further information can be obtained from Messrs. Crawford & Lockhart, of same address.

Crushing Limit of Columns.

In preparing a plan for an electric lighthouse, M. Bourdais, the architect of the Palace of the Trocadero, investigated the height to which a column of different materials could be raised without crushing under its own weight. The weight of a pyramid with a square base may be expressed by the equation:

$$P = D^2 - \frac{h}{3}\delta$$

in which D represents the side of the base of the pyramid, h the height, and δ the density.

The resistance is: $R = \frac{P}{D^2}$

Hence $R = \frac{1}{3} h \delta$

$$h = \frac{3\ R}{\delta}$$

If we take for the limiting value of R one-sixth of the load, which produces crushing in iron, and one-twentieth for different varieties of stone, we may deduce the following table:

MATERIAL.	R.	δ.	H.
Porphyry	2,470,000	2,870	2,550 meters.
Iron	6,000,000	7,800	2,280 "
Granite	800,000	2,700	900 "

Such are the practical limits to which a pyramid might be raised in the respective materials. It is evident that the Egyptians, in the great pyramid of Cheops, stopped far below the limit. If the prismatic form were adopted, the height could be only one-third as great.—*Lumiere Electrique.*

Decay of Neglected Bridges.

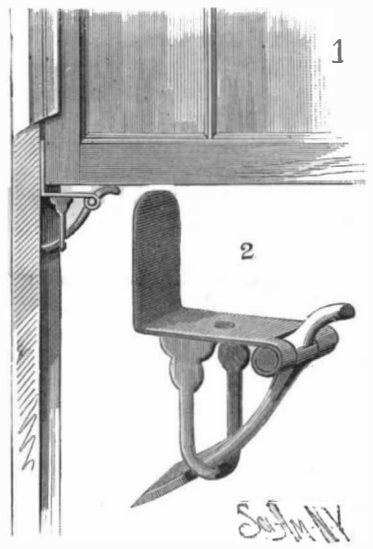
The rapid decay experienced by iron bridges which are neglected has recently been exemplified in Callowhill Street Bridge in Philadelphia. When lately the painters were set to work on this structure, their preliminary exertions in cleaning off the rust brought off flakes of oxide from one-fourth inch to three-eighths inch in thickness. This at once revealed the extent to which the injury had already gone, and called attention to the necessity of an immediate survey. The fact that the weakening process had already proceeded to a dangerous extent was shown by the vibration, which was so violent that the men had to hold on when a heavy load passed over, to avoid being shaken from the swinging stages. On examination, it was found that not only had rust invaded the material of the girders, but that the whole bridge, which is built on a rising grade, had moved down hill so far as to tear out the top courses of the upper abutment, and to buckle the struts of the intermediate supports, while the movements of the roadway had cracked the asphalt and forced out the paving blocks between the tram rails. The bridge crosses a railway, and provides for the street traffic above it; it includes one span of 340 feet. The structure was only completed in 1875, and thus ten years of neglect have sufficed to bring it to the verge of destruction.

Brick Walls.

Except upon sites where stone can be quarried in the immediate neighborhood, we are all familiar with the economical advantages possessed by brick over stone as a material for walls. A two-brick wall is equivalent in strength to one in solid masonry 2 ft. in thickness, and here is a saving of 6 in. in space on every average external wall—no mean consideration on a town site where the ground is valuable. That bricks absorb more moisture than most kinds of stone is admitted, but they do not retain it for so long a period, and it is consequently less liable to find its way through brick walls. But apart from this, there are methods of protecting brick walls from damp, which we should shrink from applying to stone. If we were to affix ornamental hanging tiles to the surface of a stone wall, such concealment of a fine natural material would be regarded as a piece of vandalism in art almost equal to the application of cement. Hanging tiles form one of the most picturesque of coverings for external walls, and greatly conduce to the appearance of home-like comfort which the exterior of a dwelling can be made to suggest; while, if glazed, they will not absorb moisture.—*Brick and Tile Gaz.*

PORTABLE SASH SECURER.

The form of this improved window sash fastener, which can also be used with advantage as a sash lock, is clearly shown in Fig. 2, while the manner of applying it to the window to hold the sash is shown in Fig. 1. In the outer end of a steel plate bent at right angles is pivoted a lever, one arm of which extends above the plate and is curved as shown; the other arm



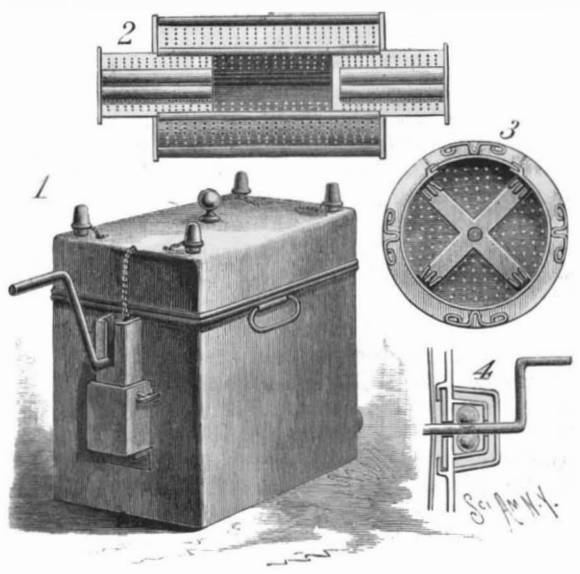
BETTERMANN'S PORTABLE SASH SECURER.

extends downward, and is made wider at its lower end and sharpened at the edge, so as to engage the guide rail of the sash when the device is placed in position for use. A U-shaped frame, riveted to the under side of the plate, prevents the long arm of the lever from dropping too far. To use the fastener, the sash is lifted and the upwardly bent portion of the plate inserted between the sash frame and the guide rail. The sash is then lowered so as to rest upon the short curved arm of the lever, when its weight throws the sharp lower edge of the lever against the rail, so as to bite into the same and thereby support the sash. To lower the sash, it is first lifted to permit the removal of the fastener. When used as a sash lock, the fastener is placed in an inverted position at one of the upper corners of the sash, when the latter cannot be opened from the outside.

This invention has been patented by Mr. R. Bettermann, of Cambria, Penn.

AN EASILY OPERATED WASHING MACHINE.

The illustrations herewith show a washing machine in which a perforated drum, holding the clothes, is placed in a boiler or reservoir containing soap and water, and the whole placed upon a stove and heated, when the clothes are washed by revolving the drum with a crank handle. Fig. 1 is a perspective view of the apparatus, Fig. 2 a plan representing the end covers partly drawn out, and Fig. 3 a transverse sectional elevation, Fig. 4 showing the working of the crank. The cover has an escape tube for the steam, with a cap to regulate its pressure, and there are ribs



ROGERS' IMPROVED WASHING MACHINE.

within the cylinder, which, as it revolves, raise the clothes and let them fall, and also cause the water to fall on them as the drum revolves; there are, besides, water elevators, formed by bent plates of galvanized metal, which take up the water and suds as the drum revolves, and cause it to pass through the perforations, so as to fall upon the clothes. This invention has been patented by Mr. Henry B. Rogers; particulars can be had from Messrs. Potter & Son, of Marshall, Mo.

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REPAIRING THE COOPER INSTITUTE.

So well known is the aim of Cooper Institute, and so widespread has been the good accomplished during the thirty-two years of its existence, that any statement regarding its work, except of the most general kind, would be superfluous. Founded by the philanthropist Peter Cooper, and amply endowed by him, it is devoted, with its entire income, to the instruction and elevation of the working people of New York city, irrespective of age, sex, or condition.

The building occupies a whole block, being 86 feet on Seventh Street, 155 feet on Third Avenue—the front shown in our frontispiece—143 feet on Eighth Street, and 195 feet on Fourth Avenue. Originally there were but five stories and a basement, the latter containing the large lecture room, which is 125 by 82 feet and 21 feet high; but a few years since, an additional story was placed over the entire building, two stories were raised over a part of the Third Avenue side, and the southern end (to the left in the engraving) was raised to a total of eight stories. This additional load, together with errors in the design, made necessary the extensive repairs which have been in progress for several months, and which are now nearing completion.

The piers supporting the walls facing the avenues were placed beneath the center lines of the window spaces of the third or reading room story, and also beneath the piers of the third story. The piers under the window spaces thus had but little or no load to carry beyond their own weight, and, as a natural consequence, the lintels and window sills were fractured by the strains produced by the bearing piers moving downward, thereby causing an upward reaction through the line of the intermediate ones, or those having no load. To remedy this defect, which is by no means an uncommon one, even in buildings of recent date, all the bearing piers were removed, and others were built having a larger section and an increased area of foundation, while the flat lintels of the second story were replaced by segmental stone arches. During this work the walls were supported upon shoring, as shown clearly in the engraving. Beneath the lower portion of each of the third story piers were placed two pairs of heavy iron I-beams 15 inches deep and two sets of heavy yellow pine timbers. The interior shores extended from floor to floor to the basement, where they rested upon a crib formed of timbers; the large foundation area thus obtained rendered easy the adjustment of the shores by the screws. Outside there were two shores to each needle, and where there were vaults under the sidewalk, the arches were centered, and held by shores. Struts were wedged across the lower part of each window space.

The ceiling of the lecture room was supported upon three rows—parallel with Fourth Avenue—of cast iron columns, 12 inches in diameter, spaced 18¾ feet apart; at right angles to the rows, the columns were 18 feet apart, and the outer rows were 20⅔ feet from the piers. Upon adjacent columns, and in a direction perpendicular to the avenue, were two brick arches (shown in Fig. 9), the space between which was filled in; the lower arch was designed to carry the ground floor, and the semicircular one served to distribute the weight of the dividing walls and the piers and columns which extended upward through the several stories of the building to the columns. The piers upon which the outer line of arches rested were so narrow that the line of thrust fell outside the base, and the pressure was not transmitted to the retaining wall, owing to the height at which the arch joining the wall and piers was placed. As repaired, the foundations of the piers are 10¾ feet square, and the arch is so curved, as shown in Fig. 8, which represents the lecture room finished, with the exception of the floor, that the line of thrust falls well within the base. In both the new and old constructions, Figs. 8 and 9, the thrust is indicated by the dotted lines. After this row of arches had been completed, the upper walls were found to be too weak to carry the load; the arches were then centered, and were supported by vertical and radial shores, while the adjoining ones were put in. All of these arches are of cut stone.

The columns were originally supported upon foundations consisting of an upper granite block 2 ft. square by from 11 to 12 in. thick, and by an under block, which in several instances was divided, 4½ by 4⅔ ft., and 16 in. thick. The upper block is now 4 ft. 8½ in. by 4 ft. 10½ in., and 1 ft. 10 in. thick; the lowest course of concrete is 8 by 9 ft. (The entire building rests upon sand, and in every case the foundations of the piers and columns have been increased in area and extended deeper.) The columns are of cast iron, 16 in. in diameter.

The plates and wedges used with the columns are shown detached and separated in Fig. 5 and in position in Fig. 6. Wedging similar in principle to this, but in form corresponding with the situation, was used at the front walls for the removal of the shores and elsewhere in the building. The facing surfaces of each plate are recessed to receive the wedges, which are sharp and planed true; a slight tap with a small hammer upon each wedge successively brings each to a bearing, and insures an even distribution of weight. The plates were bedded in pure Portland cement. The columns in the reading room in the third story were directly over the outer rows in the basement, and that portion of the room between these columns—37 ft. wide and 90 ft. long—passed through the third and fourth stories. The ceiling over this space, Fig. 2, was held by girders supported at the end upon columns and at the center by rods from the roof. These girders at the ends of the reading room, as shown in the cross sectional view, Fig. 4, and at *b* in Fig. 2, were made up of two deck beams each 7 in. deep, put bulb to bulb and held by bolts through the flanges. A permanent deflection averaging about 2 in. had taken place. These are reenforced by the placing of two heavy I-beams, one at each side, as shown in the section, Fig. 3, and at *a*, Fig. 2. To relieve the roof a center row of columns has been erected. While the repairs in the reading room and the strengthening of the walls in the lower stories were going forward, the central portions of the floors were cut away. The columns in the reading room were carried by shores extending to the basement floor. About the upper part of the column were firmly bolted the carefully fitted sections of an iron jacket shaped as shown in the upper part of Fig. 7; the shores bore against the extended under side of this jacket, and held the column during the building of the new wall.

In the foregoing we have attempted to describe only the main features of the principal changes, and to briefly mention the causes making them necessary. This building was the first one in which iron was used extensively; and owing to the experimental condition in which the use of this material then was, there crept into the design errors in form and proportioning which the experience of later years enables the builder to steer clear of. All such parts have been either entirely removed and rebuilt, or have been strengthened. During the repairs, the load in every case has been carried to the basement by shoring always placed vertically in line, thereby obviating the risk of having an unusual weight brought upon the floors. All the division walls and the columns have been carried up vertically in line with the basement columns, and have been made of such size as to insure ample strength.

It is estimated that these repairs will cost in the neighborhood of $250,000, the building costing originally $650,000; this expense thus far has been borne by a few gentlemen whose names we are not at liberty to give, but to whom all praise is due for their generous and unostentatious support of so good a work. The architect under whose direction the work has been most successfully prosecuted is Mr. Leopold Eidlitz. Mr. J. H. Smith is the builder, and Mr. Isaac Whitenack, the foreman of masons.

PHOTOGRAPHIC NOTES.

Increasing the Sensitiveness of Orthochromatic Plates.—From recent experiments described in the *Photographische Wochenblatt* by V. Schumann, and translated by the *Photographic News*, it appears plates prepared with a bromo-argentic emulsion containing also an ammoniacal solution of eosine are not as sensitive to yellow and red colors as those coated with the ordinary Eder silver, oxide, ammonia emulsion, and then dipped for two or three minutes in an aqueous solution of eosine to which a little ammonia is added. After immersion, the plates are dried and then exposed in the camera.

The pyro and potash developer is preferred, and very brilliant results are obtained when the emulsion contains bromide and iodide of silver formed simultaneously.

It is also advised not to use an emulsion of high speed, as the dipping bath then tends to fog the plate. It is probable, in photographing colored objects, the bath plates will prove to be superior, as they will render more accurately the different shadings of colors in consequence of being more sensitive to yellow.

Removing Silver Stains.—Dr. H. W. Vogel recommends the same compound used as a reducer for removing stains of silver from the hands or clothes. A few crystals of ferricyanide of potassium are dissolved in a solution of hypo, or instead a 10 or 20 per cent solution of the ferricyanide is added to the hypo, and then applied to the stains. The advantage of this solution is that it is not poisonous, and does not destroy the color of articles of clothing.

Antwerp Prizes for America.

The juries at the Antwerp Exhibition made the following awards to American exhibitors:

Diploma of Honor.—Davis Sewing Machine Co.

Gold Medals.—Westinghouse Co., general machinery; New Home Sewing Machine; Geo. Bruce, Son & Co., paper ware.

Silver Medals.—Meriden Britannia Co., metal ware; Rochester Lamp Company; Santa Maria & Co., food products; Washington Packing Co.; San Jose Fruit Packing Co.; Arpad, Haraszthy & Co., liquors.

Bronze Medal.—Seabury & Johnson, chemicals.

Honorable Mention.—Leonard & Ellis, chemicals; Mr. Cooleman, chemicals; Lloyd & Suppler, tools.

Correspondence.

A "Gateway of Knowledge."

(FROM AN OLD SUBSCRIBER.)

To the Editor of the Scientific American:

My attention has been called to the fact that this is the fortieth year of the publication of the SCIENTIFIC AMERICAN. The first paper was published the year of my birth, in 1845; and I can say that I have been one of its readers for twenty years, or since I was twenty years old. I hesitate not to say that the SCIENTIFIC AMERICAN is one of the gateways to knowledge, and the SUPPLEMENT, its near relative, I have taken from its first edition. As journals of science, they have no equals. CHAS. MCCUNE.

Decatur, Macon County, Ill.,
November 16, 1885.

An Improved Thermometer Required.

To the Editor of the Scientific American:

One of the greatest aids in medicine is the clinical thermometer. As generally used, it consists of a glass tube having a bulb for the mercury, a construction in the bore between the bulb and main tube for maintaining the index, and a bar divided into degrees and tenths, the graduation running from 90° to 110°. The index is the important point. It is usually obtained by causing a portion of the mercury column to separate from the main column or from the mass of mercury in the bulb, so that it shall remain *in situ*, and register the degree of heat of the body after it is removed from contact with the body. Great trouble is experienced in maintaining this index, and many ingenious methods have been devised to overcome the annoyance of "losing the index" by constructing, turning, or twisting the bore of the tube. The bulb may be of various shapes, as an elongated cylinder, or even disk-shaped. The glass tube may be round, oval, hemispherical, or even triangular in section. The bore of the tube may be backed with white or black enamel, and the tube over the bore may be so made that it shall magnify the mercury.

With all its improvements, however, the material of which the thermometer is made remains the same, namely, glass—the great objection to which is its liability to breakage. In spite of hard rubber cases with shoulders, metal cases with chains, and other safeguards, thermometers will break. To enumerate the ways in which they may break would be useless; it is sufficient to say that they do break, and it becomes an item of no small expense to keep one's self in thermometers.

The one who can invent and put upon the market unbreakable thermometers will not only confer a great benefit upon the medical profession, but will enrich himself greatly. Such a thermometer must be accurate in measuring temperature and in recording it, and it must be permanent, that is, always record a given temperature correctly. It need not cover a scale of more than 20°, viz., 90° to 110°, but this scale must be divided into fifths at least, and tenths, if possible. The dial or scale must be of a size that can be easily read, or, if very small, must be magnified by a lens covering it. The whole thermometer must be of convenient size and shape. It may be a moderately long cylinder, 3 inches to 6 inches by ¼ inch to ½ inch, or a disk of moderate thickness and diameter, or an ovoid not larger than a robin's egg. The mechanism, including the dial, must be inclosed in a covering impermeable to moisture, and one that can be easily cleaned, preferably hard rubber. The different expansibilities of different metals would suggest one or more compound metallic bars, tubes, or plates, straight, curved, twisted, or coiled upon themselves or corrugated, one end being permanently fixed, the other being attached to an index in such a way that there shall be no loose motion, the sweep of the index being increased, if necessary, by suitable mechanism. Hard rubber may be used in connection with metal. The steam gauge and aneroid barometer are suggestive of a form.

These remarks are presented with the hope that some person may experiment in this direction.

CHAS. EVERETE WARREN, M.D.

No. 5 Union Park, Boston, Mass.

[The above is a good suggestion, which deserves the attention of our inventors. Some of the very volatile liquids, such as ether and gasolene, might be available in the construction of a thermometer of this kind. Such a liquid might be hermetically sealed in an elastic vessel, and the expansive force generated by the heat of the body acting on the liquid could be made to operate indicating or recording mechanism.]

Buckman's Car Coupler.

In our notice of the car coupler invented by Mr. Thomas E. Buckman, of Jacksonville, Fla., in the SCIENTIFIC AMERICAN of Nov. 21, it was stated that when the cars are drawn apart—having been uncoupled—the coupler always assumes "at the instant its position for *uncoupling* automatically." It is apparent that the word *recoupling* should have been used.

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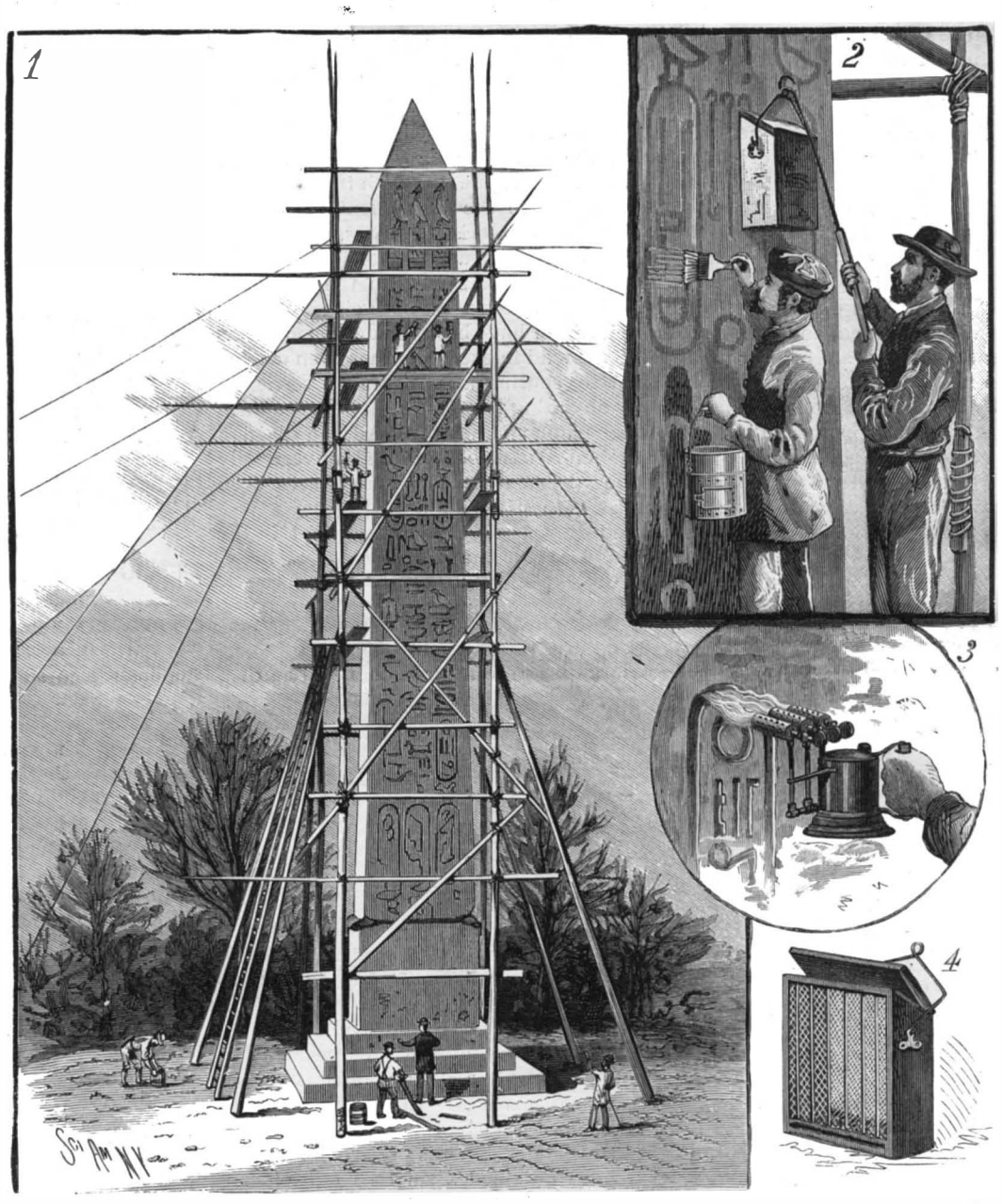
THE PRESERVATION OF THE OBELISK.

The work of preserving the Obelisk at Central Park, New York, has now been completed, and apparently none too soon, as the numerous storms which have since assailed the shaft would have done it material damage had the pores of the stone still remained open. The process employed was that described in our issue of Nov. 14, consisting of treating the heated stone with a mixture of paraffine, creosote, and turpentine, and has been applied by the Brick and Stone Waterproofing Co., of 55 Broadway, New York, who own the patents covering this treatment. As the manner of applying the process to a structure so tall and slight as the monolith attracted considerable attention, we have given somewhat detailed illustrations, showing respectively the general appearance of the shaft and scaffolding during the progress of the treatment, the process of heating the stone, the alcohol blowpipe used to penetrate the recesses of the hieroglyphics, and the construction of the charcoal furnaces. Now that the scaffolding is entirely removed, the stone shows to good advantage; and as it is a trifle darker in color, it resembles more perfectly the original syenite. The treatment has had the further effect of bringing out the characters into such strong relief that a number have been deceived into believing that they must have been recut. The process seems to have given entire satisfaction. It was, however, by no means experimental, as the company had already done much work in St. Louis, and during the past summer has treated a number of prominent buildings in New York, the white marble structure of the Mutual Life Insurance Company at the corner of Liberty Street being among the number. A severer test was that made at Newark, N. J., on the house of Mr. William Clark, the well known cotton thread manufacturer. The mansion is constructed of pressed brick and Wyoming blue stone, a small portion of which was treated two years ago. As the sample proved highly satisfactory, the entire building has recently been waterproofed. We also hear that the company has received a contract for treating all the stonework of Central Park.



THE PRESERVATION OF THE OBELISK.

The Montreal Cable Railway.

The cable railway or elevator by which the summit of Mount Royal, back of Montreal, is reached, has now been in successful operation for some days. The railway is 403 feet horizontal measurement, the height 275 feet, and the length of track 510 feet. It is built in a segment of a circle with a reversed side of twelve feet, and has an incline of about 33½ degrees. The road is supported by 16 iron pillars set in stone foundations, and the balances are of wood 12x12 inches. The gauge of the road is 5 feet, with a distance between the tracks of 4 feet. The cars are drawn to the top by means of a stationary engine of 75 horse power at the top of the mountain. The wire ropes are three in number, two of them being 1⅛ inches diameter and the middle one 1¼ inches. The two smaller ones have been tested with a strain of 35 tons, and the center or safety rope with a strain of 43 tons. The ropes pass over sheaves 6 feet in diameter, and are wound over two drums of wood and iron 10 feet in diameter, and are a direct pull upon the cars. The center or safety rope runs independently of the engine, and is attached to both cars, so that, in event of the two outside ropes breaking, the center one would hold the cars in check, besides which the large wheel of 11 feet diameter is provided with brakes, which may be applied from the platform at the top of the incline by the engineer. The fare on the incline is 5 cents up and 3 cents down.

ACCORDING to the *Deutsche Farber Zeitung*, the hardest indigo is easy to grind, dissolves better, and adheres better to the goods, if it is for 4 hours steeped in hot water with 1½ lb. calcined soda to 4 lb. indigo. When ground fine, 2 lb. soda and 16 lb. lime are added, and afterward 20 lb. pure copperas. The solution is made by heating in an iron boiler.

On Measurement.

Sir Joseph Whitworth asserts that the two great elements in mechanics are the power of measurement and the true plane.

The measuring machines which I have constructed, says Sir Joseph, are based upon the production of the true plane.

Measures of length are obtained either by line or end measurement.

The English standard yard is represented by two lines drawn across two gold studs sunk in a bronze bar about 38 inches long, the temperature being at 62° Fahr.

There is an insurmountable difficulty in converting line measure into end measure, and therefore it is most desirable for all standards of linear measure to be end measure.

Line measure depends on sight, aided by magnifying glasses; but the accuracy of end measure is due to the sense of touch, and the delicacy of that sense is indicated by means of a mechanical multiplier.

In the case of the workshop measuring machine, the divisions on the micrometer wheel represent 10,000ths of an inch. The screw has 20 threads to an inch, and the wheel is divided into 500, which multiplied by 20 gives for each division the 10,000th of an inch.

We find in practice that the movement of the fourth part of a division, being the 40,000th of an inch, is distinctly felt and gauged. In the case of the millionth machine, we introduce a feeling piece between one end of the bar to be measured and one end of the machine, and the movement of the micrometer wheel through one division, which is the millionth of an inch, is sufficient to cause the feeling piece to be suspended or to fall by its gravity.

The screw in the machine has 20 threads, which number multiplied by 200—the number of teeth in the screw wheel—gives for one turn of the micrometer wheel the 4,000th of an inch, which multiplied by 250—the number of divisions on the micrometer wheel—gives for each division one-millionth of an inch. The sides of this feeling piece are true planes parallel to each other, and the ends both of the bars and the machine are true planes parallel to each other, and at right angles to the axis of the bar; thus four true planes act in concert. In practice, we find that the temperature of the body exercises an important influence when dealing with such minute differences, and, practically, it is impossible to handle the pieces of metal without raising the temperature beyond 62°. I am of opinion that the proper temperature should be approaching that of the human body, and I propose that 85° Fahr. should be adopted, and that the standards and measuring appliances should be made and kept in a room at a uniform temperature of 85° Fahr.

In many workshops we hear the workmen speak in such vague terms as a bare sixteenth or full thirty-second, but minute and accurate measurement requires to be expressed in decimals of an inch.

In 1857, when president of the Institution of Mechanical Engineers, I read a paper on standard decimal measures of length, and I am happy to say that since that period the decimal system has been introduced to a certain extent in many engineers' works, but it is still far from being universal.

In the manufacture of our standard gauges, the workmen measure to the $\frac{1}{20000}$ of an inch, and these measures are as familiar and appreciable as those of larger dimensions.

As an illustration of the importance of very small differences of size, I have here cylindrical standards with a difference of the ten-thousandth of an inch. It is therefore obvious that a difference of $\frac{1}{10000}$ of an inch is an appreciable and important quantity.

It will be at once conceded that the only scale of measurement which can be used for such small differences must be a decimal one.

For many years the decimal system has been in use at our works, taking the inch as the unit, and the workmen think and speak in tenths, hundredths, and thousandths of an inch.

It is of great importance to the manufacturer to have the means of referring to an accurate fixed measure, as it will enable him, at any time, to reproduce a facsimile of what he has once made, and so preserve a system of the sizes of the fitting parts unaltered.

The great value of the workshop measuring machine is making difference gauges.

Every external diameter having to work in an internal diameter should have a certain difference of size; and close observation and experience can alone determine what this difference of size ought to be.

Take, for instance, a railway axle; if the bearing in which it has to work be too small, the heating of the axle by rapid rotation will be the consequence; if, on the other hand, the bearing be too large, it will be sooner worn out.

It is therefore most important, when rapid revolutions and great strains have to be undergone, that the proper difference of size, when once ascertained by experience, should be strictly adhered to.

In the manufacture of axles there should be two gauges used, the axle being made to the standard gauge and the bearing bored out to fit a difference gauge, which has to be as much larger as experience has found to be necessary, according to the conditions under which the axle has to work. Hence every manufacturer should be in a position to select his own difference gauges.

Fifty years ago the thousands of spindles in a cotton factory had each to be separately fitted into the bolster in which it had to work. At the present time all these spindles are made to gauge, and are interchangeable.

It cannot be impressed too forcibly, both upon the student in mechanics and upon the workman, that accuracy of measurement is essential for good and efficient workmanship, and that it tends to economy in all branches of manufacture, so as to have the parts interchangeable.

The Business Importance of Burglars.

W. S. Gilbert, in the London *Times*, says: "For my part, I could never quite understand the prejudice against burglars. An unarrested burglar gives employment to innumerable telegraph clerks, police officers, railway officials, and possibly also to surgeons, coroners, undertakers, and monument masons. As soon as he is in custody, the services of a whole army of solicitors, barristers, judges, grand and petty jurymen, reporters, governors of jails, and prison warders are called into requisition. Really, the burglar does more good than harm."

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MONCRIEFF GUN CARRIAGES FOR RUSSIAN IRON CLADS.

Messrs. Easton and Anderson recently issued invitations to officers of Government manufacturing departments and foreign attaches to visit their works at Erith, in order to inspect the Moncrieff gun carriages made by them for the new Russian ironclad Catherine II. This vessel will probably have about 10,000 tons displacement. She is to carry six 50½ ton breech-loading guns in a central breastwork with steel plate protection overhead, somewhat resembling that adopted by the French in the Admiral Duperre and other barbette ships. The general form and position of the breastwork may be seen in Fig. 1. The guns are in pairs on turntables, and have a large scope of all-round fire. The breastwork only extends to a height of 22 inches above the surrounding deck, so that the battery is not conspicuous, and the guns but little exposed to view even when in their firing position. The breastwork consists of 12 inch compound plates made under Messrs. Cammell's direction in the new Russian factories, backed by about 12 inches of wood and a strong framework. The gun is very powerful. The projectile weighs 731 pounds, and the muzzle velocity is estimated at 1,950 feet per second. This gives 19,260 foot tons energy, with a perforation per inch circumference of 511·2 foot tons, which is equivalent to the perforation of about 23·7 inches of iron. The rule of thumb would give 23·4 inches, this being a case where the sectional density of the projectile is very high. The gun itself is made on the Krupp system. We do not ourselves, says the *Engineer*, like the section—a large heavy central tube is strengthened by several layers of short steel hoops over it. The whole of the longitudinal strain falls on the inner tube, which supports the wedge on the Krupp system.

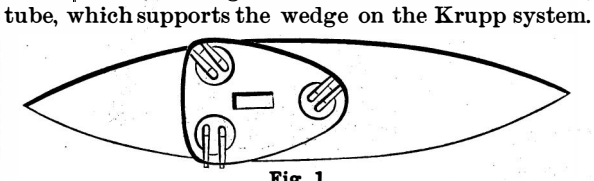

Fig. 1.

The individual steel tubes taper, and consequently their thickness from end to end varies, we think, too much. We believe that in future patterns the Russians contemplate the adoption of the interrupted screw breech in place of the Krupp wedge. Whatever may be thought of the details, however, the gun is very powerful, and the battery, of course, most formidable. As six ships are to be made nearly of the same type and power, the addition to the Russian navy is very important.

The following is a description of the parts shown as far as possible in Fig. 2.

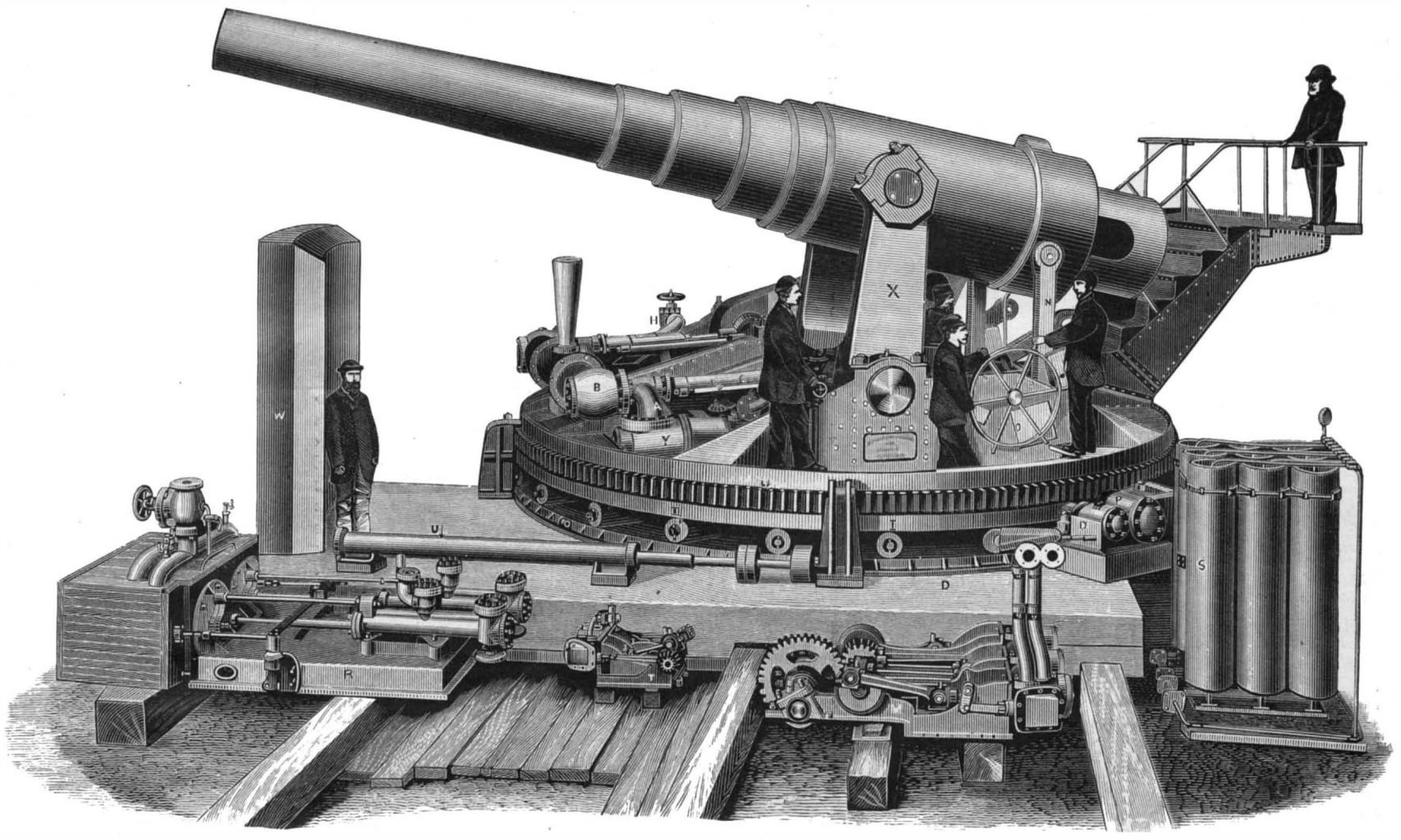

Fig. 2.—MONCRIEFF GUN CARRIAGES FOR RUSSIAN IRONCLADS.

The mounting shown in Fig. 2 consists of a cast steel roller path, D, in segments 21 feet 9 inches—6·63 meters—diameter, secured to the main deck of the ship, upon which revolves upon twenty-two live rollers, III, and round a hollow steel central pivot, a platform composed of a cast steel ring, L, filled in with a thick wrought iron deck, to which, as well as to the outer ring, two pairs of gun carriage sides, J, are bolted and riveted. The carriage sides are hollow, and composed of pairs of steel plates riveted to steel distance pieces. Each pair of sides carries, in bearings fitted with cap squares, a rocking shaft, C, on which is secured a pair of levers, X, the upper ends of which are formed into the trunnion bearings for the gun, and are fitted with cap squares, while the lower ends of the levers have threaded through them a spindle, on to which is coupled a pair of connecting rods, the tail ends of which terminate in spherical ends, which abut against

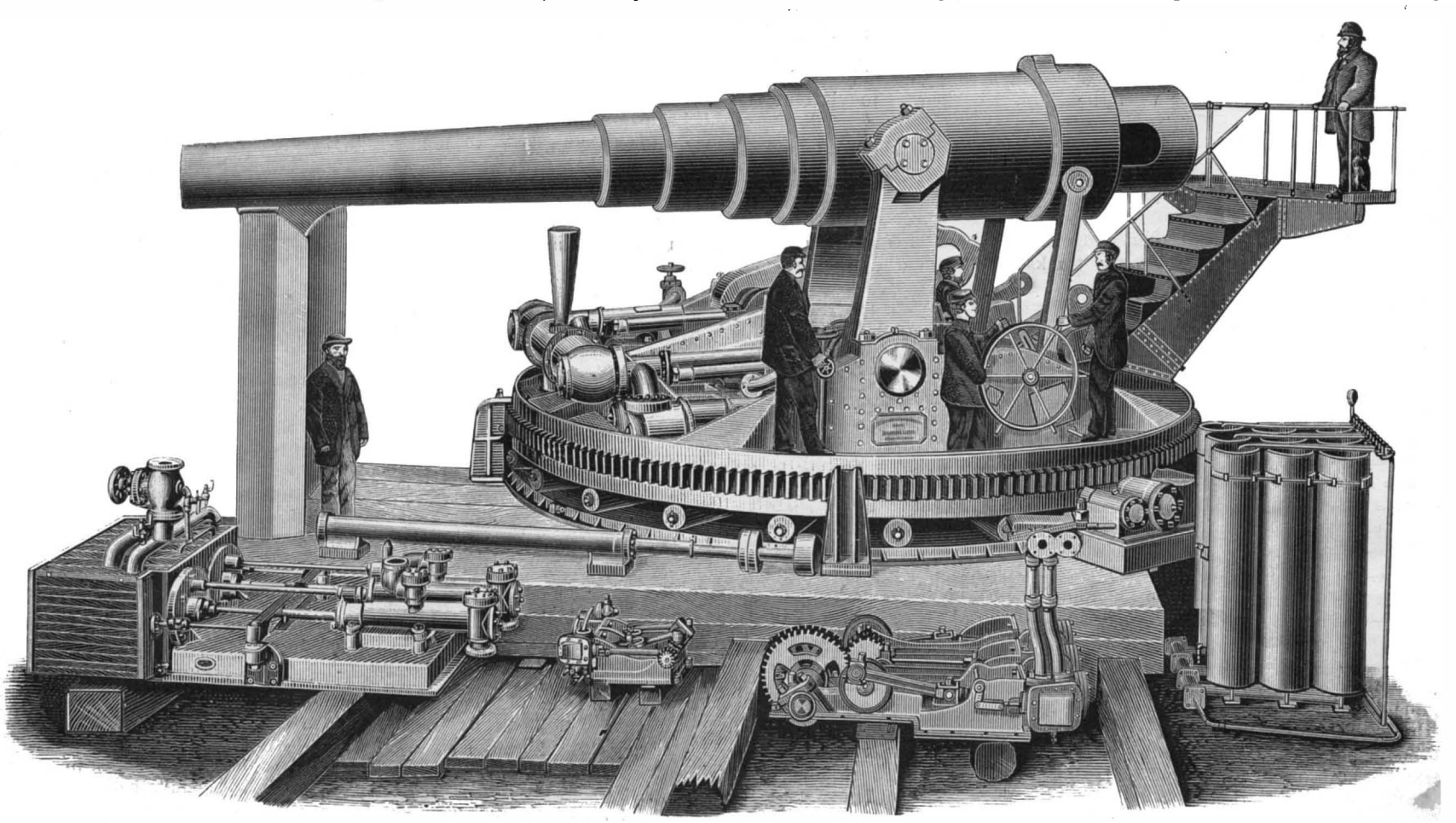

Fig. 3.—MONCRIEFF GUN CARRIAGES FOR RUSSIAN IRONCLADS.

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the bottom of the steel hollow plungers, which work into the recoil cylinders. These cylinders, Y, are placed in the forward end of the carriage under the gun, and are secured by bolts and rivets to the carriage sides and to each other. To the upper forward end of each cylinder is fitted an escape pipe, A, which joins a recoil valve chest, B, common to each pair of cylinders. The recoil valve consists of an ordinary conical valve fitted with a strong steel spindle, which passes through a balancing cylinder and stuffing box toward the main rocking shaft, C, which carries the gun.

Inasmuch as the weight of the gun has more and more effect on the plungers as it falls, it is necessary to vary the load on the recoil valve, because a hydraulic pressure which would be sufficient to hold up the gun in any position will be too great to allow the gun to recoil down to the proper loading position. This adjustment is effected by loading the recoil valve by means of disk springs, E, threaded on its spindle and abutting on a crosshead, F, which is connected by means of a pair of tension rods with a cam movement on the main rocking shaft, the cams being so arranged that there is least tension on the springs when the gun is up, and most when it is quite down.

Gun Mounting on the Moncrieff Disappearing System, to mount two 12-inch breech-loading rifled guns of 50½ tons weight, for the Imperial Russian Navy. By Easton & Anderson, 3 Whitehall Place, London, and Erith Ironworks.

Caliber of gun	12 in.	305 mm.
Length over all	30 ft.	9.14 meters.
Weight	50·47 tons	51,271 kilos.
Weight of shot	731 lb.	331·5 kilos.
Weight of powder	248 lb.	112·4 kilos.
Muzzle velocity	1,950 ft.	591·3 meters.
Weight of carriage	100 tons.	101,134 kllos.
Fall of g n	4 ft.	1·22 meters.
Diameter of turrets	35 ft. 6 in.	10·82 meters.
Height of turret	9 ft.	2·74 meters.

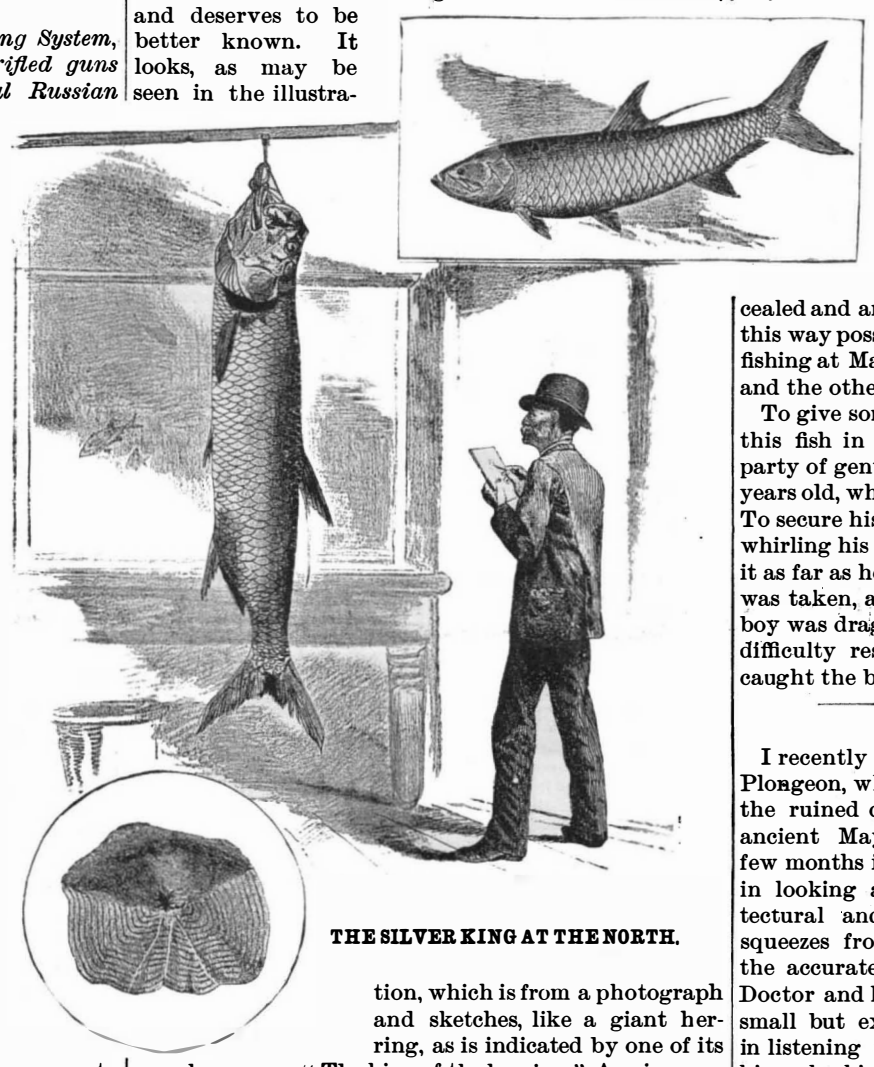
The outer end of the valve spindle is screwed, and carries a disk and pair of nuts, by means of which any desired initial tension may be placed on the springs. The pressure in the recoil cylinders during discharge is expected to vary between 48 atmospheres and 55 atmospheres. The water from the recoil valves is discharged into a large cast iron pipe common to both pairs of cylinders, by means of which it is conveyed into the central pivot casting, and so back into the tank from which the pressure pumps draw their water. For raising the guns, water, under about 66 atmospheres pressure, is admitted to the rear and upper end of the cylinders, that is, the ends nearest the center of the carriage, by means of a stop valve controlled from the side of the carriage. The plungers do not fit their cylinders fully, but terminate in pistons of a little larger diameter, through which there are holes which always keep up a free waterway between the forward end of the cylinders and the annular space to the rear of the pistons.

The pipes, H H, by which the water for raising the gun enters, communicate with the cylinders close to their glands, the water makes its way freely through the pistons to the forward end until the pistons reach the opening of the pipes, and then, as the gun rises further, the pistons gradually close the opening, and thus by throttling the water bring the gun gradually to rest in its firing position. The guns can be lowered slowly by letting the water escape from the cylinders through a small screw stop valve placed beside the main lifting valve, the water in this case also returning to the pump tank. The rotation of the gun platform is effected by means of teeth, L, cast in the upper roller path which forms the frame of the platform. Into these teeth gears a cast steel pinion keyed on a vertical shaft, which descends through the main deck to that beneath, M, where it is actuated by a double-acting three-cylinder engine, the movement of which can be controlled through the center pivot by means of a system of rods and levers worked by hydraulic notch hand gear placed between the pair of guns. The elevation of the guns is accomplished by elevating bars, N, attached at their upper ends to trunnions formed on the rear ends of the guns, and at their lower ends to screw lifting gear contrived in the hollow carriage sides about O, and so adjusted in form and disposition that the guns always recoil into the same loading position, whatever the elevation may be. The gun platform is prevented from turning excessively from the discharge of a single gun by means of a brake, P, worked by hydraulic pressure, and it is locked in the loading position by a bolt, which is shot by the same agency; the application both of the brake and of the bolt is performed automatically by the hydraulic hand gear for rotating the platform.

Hydraulic pressure is supplied by means of a direct-acting automatic duplex pumping engine, R, capable of delivering 20 cubic feet per minute under a pressure of 66 atmospheres; this pump may be placed in any convenient position in the ship. The water under pressure is pumped into an air accumulator, S, composed of nine steel vessels grouped together, and of a capacity sufficient to raise both guns once into the firing position without the assistance of the pump. The compressed air in the accumulator is supplied by a small torpedo air compressing pump. The ammunition is served by means of an inclined endless chain actuated by small steam engines, T, and is rammed home by means of telescopic hydraulic rammers, U; the sighting platform may be seen at V, and a piece of barbette wall at W.

THE SILVER KING IN NORTHERN WATERS.

A tarpon (*Megalops thrissoides*), or silver king, as it is often called, measuring 5 feet 9 inches, and weighing, when taken, 110 pounds, was caught last Monday (August 17) in a seine by a fisherman off Sea Bright, New Jersey, and exhibited at the stall of Eugene Blackford, the fish commissioner. This fish, though rarely taken in Northern waters, is very abundant about the coasts of Florida and throughout the Gulf of Mexico, and deserves to be better known. It looks, as may be seen in the illustration, which is from a photograph and sketches, like a giant herring, as is indicated by one of its popular names, "The king of the herring." A spine projecting back of the dorsal fin measures 12 inches in length, and looks like a terrible weapon of offense or defense, though there is no account of its being used as such. One peculiarity of this beautiful fish is its large and brilliant scales, measuring on an average over three inches across, covered with a luster that resembles silver, and in part somewhat translucent, showing beautiful red markings, when fresh and held against the light, like thin cowry shells. They are used in Florida in the manufacture of artificial jewelry.



THE SILVER KING AT THE NORTH.

If required to name the best North American game fish, the one whose capture is accompanied with the greatest amount of pleasurable excitement, the one requiring the greatest amount of skilled and practiced muscle on the part of its captors, I would unhesitatingly give preference to the silver king; multiply the vigorous resistance of a 24 pound salmon by five or six, or a large bluefish by a multiple twice as great, and you have some idea of the difficulty of landing a full grown silver king. A fish takes your bait with a rush. If inexperienced in tarpon, your finger is cut to the bone. The line fairly whistles as it leaves the spinning reel. It all runs out, parts at its weakest point, and the fish carries your tackle out to sea. Many are hooked, but very few caught.

There is, or was, I believe, a standing offer to pay for an excursion ticket to Florida and three months' expenses to any one who would land a tarpon with rod and reel, so difficult is the taking of this fish; and yet that the difficulties of thus catching them are not insurmountable may be seen from the account published in the SCIENTIFIC AMERICAN of May 23, 1885, of a specimen weighing 93 pounds, having been taken on a 21 thread line and 5 foot bamboo rod.

The experience of Mr. W. H. Wood can be had by any skilled fisherman with suitable tackle. At present, tarpon fishing is scarcely known as a sport, and the best means and appliances for taking the fish are scarcely determined. The inside of the mouth is very tough and elastic, and the fish seems to possess the power of ejecting the bait by protruding its fleshy tongue. The upper jaw is armed with minute teeth; and consisting, as it does, of movable plates working against the upward pointing lower jaw, invariably cuts the line, which necessitates the use of plain wire, to which the hooks are soldered, or some such device to secure a hold. A writer in the *American Angler* for Dec. 15, 1883, recommends the following barbarous and possibly unsportsmanlike rig for the capture of this noble fish:

"I take the heaviest piano wire obtainable, and make three joints four inches long and three six inches in length. The joints of the links are made by heating the wire in the fire, bending each end, allowing half an inch for soldering. Before soldering, I polish each piece of wire with emery paper, and tin it to prevent rusting. To the upper link I attach a strong brass swivel, two and a half inches long. I wrap the ends of the wire below the loops with fine copper wire, and finish the job with common solder. I use hooks two inches from tip to shank. To each of the three lower links I solder two hooks at a right angle. When completed, the hooks are in two lines. For bait, I cut a mullet in half from mouth to tail. I pass one hook through the eye, one amidships, and the other near the tail. Three hooks pass through the bait with points exposed, and the three others pass beyond the edge of the bait. In addition, I take a packing needle and fine twine, and tie the links to the bait. By adopting this course I make an attraction, and armed with hooks partially concealed and an almost invisible snood. Tackle rigged in this way possesses great strength, for the last time I was fishing at Mayport, I captured two sharks, one seven and the other nine feet in length, with my tarpon rig."

To give some idea of the almost resistless power of this fish in making "a rush," the story is told of a party of gentlemen, among whom was a lad fourteen years old, who were fishing in the surf at Pelican Island. To secure his line, the boy had tied it about his waist; whirling his weighted hook about his head, he threw it as far as he could out to sea. In a moment his bait was taken, and in another the screaming, struggling boy was dragged into the surf, from which he was with difficulty rescued by his companions. The fish had caught the boy.

The Art of Ancient Yucatan.

I recently passed an evening with Dr. and Mrs. Le Plongeon, who, after twelve years spent in exploring the ruined cities of Yucatan and the modern and ancient Maya language and character, are passing a few months in this country. The evening was passed in looking at photographs of the remains of architectural and plastic art, in examining tracings and squeezes from the walls of the buildings, in studying the accurate plans and measurements made by the Doctor and his wife of these structures, in reviewing a small but exceedingly choice collection of relics, and in listening to the Doctor's explanation of the Maya hieroglyphic system. Whatever opinion may be entertained of the analogies which the Doctor thinks he has discovered between Maya culture and language and those of Asia and Africa, no one who, as I had the privilege of doing, goes over the actual product of his labors and those of his accomplished wife, can doubt the magnitude of his discoveries and the new and valuable light they throw upon ancient Maya civilization. They correct in various instances the hasty deductions of Charney, and they prove that buried under the tropical growth of the Yucatan forests still remain monuments of art that would surprise the world were they exhumed and rendered accessible to students — *Dr. D. G. Brinton, in the American Antiquarian.*

The Jewish Population of the World.

The *Bulletin* of the Geographical Society of Marseilles estimates the total number of Jews in the world at 6,377,602—that is, 5,407,602 in Europe, 245,000 in Asia, 413,000 in Africa, 300,000 in America, and 12,000 in Oceania. The European Jews are distributed as follows: 1,643,708 in Austria-Hungary, 561,612 in Germany, 60,000 in Great Britain, 3,000 in Belgium, 3,946 in Denmark, 1,900 in Spain, 70,000 in France, 2,652 in Greece, 7,373 in Switzerland, 8,693 in Holland, 36,289 in Italy, 600 in Luxemburg, 200 in Portugal, 260,000 in Roumania, 2,552,145 in Russia, 3,492 in Servia, 3,000 in Sweden and Norway, and 116,000 in European Turkey. There are about 150,000 in the Asiatic provinces of Turkey, 15,000 in Persia, 47,000 in Asiatic Russia, in India and China 19,000, and 14,000 in Turkestan and Afghanistan. In Africa, there are about 35,000 in Algeria, 100,000 in Morocco, 55,000 in Tunis, 6,000 in Tripoli, 200,000 in Abyssinia, 8,000 in Egypt, 8,000 scattered over the desert, and about 1,000 at the Cape of Good Hope.

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ENGINEERING INVENTIONS.

A railroad rail spike forms the subject of two patents issued to Mr. Thomas A. Davies, of New York city. According to one of the patents, the heads are laterally inclined upon their lower sides, to give them a substantial bearing upon the flanges of the rails when the spikes are driven into the ties in an inclined direction. The other provides for the head of the spike having its lower part in the form of a frustum of a cone, with its axis at right angles with the axis of the spike body, to give a firm bearing on the rail flanges whether the spikes are driven vertically or not.

A stay plate for railroad rail spikes has also been patented by the same inventor. Combined with the rails, ties, and spikes are tapered plates, of a width greater than that of the spikes, driven into the ties at the outer sides of the spikes, and transversely with the grain of the wood, to hold the spikes firmly in place against the rail flanges, and prevent the rails having any lateral movement.

A center fastening for railroad rails, likewise patented by the same inventor, provides for recesses in the edges of opposite flanges of the rail, in which are driven inclined fastening spikes, at opposite inclinations on opposite sides of the rail, such improvement being especially applicable on single track railways, to resist the tendency of the rails to creep in either direction.

MISCELLANEOUS INVENTIONS.

A tool handle has been patented by Mr. Frank Cronin, of Deming, New Mexico. This invention covers a double ratchet mechanism, made for easy adjustment, to allow rotation of the bit in either direction, and is intended for use with all sorts of hand tools requiring a rotary motion.

A machine for sewing looped fabrics has been patented by Mr. Joseph M. Merrow, of Merrow, Conn. This invention relates to machines for uniting parts of stockings or other knit work, and covers an attachment whereby the thread that unites several articles is cut automatically instead of by hand.

A hand saw has been patented by Mr. Alfred Fornander, of Brooklyn, N. Y. Combined with a stock or handle are a straining bar and cam lever, for locking the straining bar on the stock or handle, to facilitate placing and securing saw blades of various sizes in the frame, the improvement being especially applicable for hack saws and butchers' saws.

An insect destroyer has been patented by Mr. Dudley H. Manning, of Sibley, Iowa. Combined with an inverted conical ring holding a frame with a lamp within it and a transparent shade around the lamp are reflectors, and a conical hood above the lamp, the apparatus being placed on the top of a pail or other vessel partly filled with water, which is thus illuminated and attracts insects.

An endless band or cord has been patented by Mr. Leedham Binns, of Philadelphia, Pa. It is tubular plaited, united at its ends by each of the ends being inserted bodily and longitudinally in reverse direction to each other within the portion of the body of the band next adjacent to the other end, being specially designed for driving the spindles of spinning machines and other machinery.

A loom shuttle has been patented by Mr. Charles N. Newcomb, of Omaha, Neb. It is designed especially for rag carpet looms, and has tension regulating springs projecting into its eye, with a rag receiving can having an open end adapted to be placed within the shuttle body, the can holding a large quantity of rags and delivering the weft with a light and uniform tension, without twisting.

A windwheel has been patented by Mr. Franklin G. Tallerday, of Poplar Grove, Ill. Its wings are made of sail cloth or similar material, in a suitable frame to be expansible and contractible, and the construction is such that the wind, acting upon the concave part of the wing, opens it to its fullest capacity, and when blowing on the convex surface closes the fan or wing part way down.

A bicycle has been patented by Mr. Selden A. Jan Graw, of Nashua, N. H. This invention covers a novel construction of parts and details in a bicycle whose speed can be regulated as desired by changing the proportional sizes of toothed wheels which transmit the power, and which has a safety attachment to prevent headers or the tilting of the bicycle.

A metallic sole for boots or shoes has been patented by Mr. William T. Milholland, of McKeesport, Pa. It has closed hollow projections on its outer face, such projections being struck from the body of the metal of the plate, so as to inclose air spaces on the sole when applied, and the plates being fastened on by nails or screws, making boots or shoes well adapted for mill men or others having to walk over hot floors.

A permutation lock has been patented by Mr. Walter E. Malley, of New Haven, Conn. Combined with a casing, sliding bolt, and sliding tumbler are ratchet wheels adapted to engage with the tumbler, and push pins or other devices for turning the ratchet wheels, the latter being held in place by pawl springs which can be disengaged from the wheels, making a lock that is simple, safe, and not liable to get out of order.

A shoulder brace has been patented by Messrs. William Carroll and John Meekison, of Columbus, Ohio. Besides the usual features of a shoulder brace, the straps are connected with wires or cords made to extend down to each heel, where there is, in the hollow boot heel, a spring, rack, and pinion, which operate to make a pull on the brace to hold the shoulders back when the weight of the body is resting on the feet.

A wool washing machine has been patented by Mr. James E. Sinclair, of Waverly, Md. This invention covers improvements in a former patented machine of the same inventor, the machine having a series of connected receptacles in which the wool is successively treated, the receptacles being combined with one or more pumps for elevating the wool and water, and elevators for returning the water to the place from whence it was drawn.

Special.

AMONG THE BANK NOTES.

The American Bank Note Company is the largest as well as the oldest corporation in this country devoted to the work of designing and engraving bank notes, coupon bonds, and all that extensive class of fine art commercial literature. It dates back as far as to 1795. It printed the work for Government securities as long ago as 1809. One of the oldest engraving firms outside of this great concern was that of Rawdon, Wright, Hatch & Smillie, whose name is familiar to all who handled the bonds and notes of thirty or forty years ago. Mr. Smillie, of this firm, who achieved national reputation as an artist, is now spending the years of a ripe old age at Poughkeepsie, New York. His son, William M. Smillie, Esq., is one of the Vice-Presidents of the American Bank Note Company, having charge of the detail of the artistic work in that great institution.

A well known New York editor recently visited Mr. Smillie in his office in the new building of the American Bank Note Company. This building, by the way, is the most beautiful and ample in the world for the purpose of commercial art work. It is under the shadow of the spire of Trinity Church. Its offices are spacious and elegant, and its workrooms are equipped with a wonderful perfection in everything pertaining to the designing and production of the immense quantity of fine engraving and choice printing sent out from there.

"So your father is now seventy-eight years old, is he, Mr. Smillie?"

"Yes, and for a man of his age he has had a wonderful experience. Last winter he had an attack of pleurisy. We brought him from Poughkeepsie to this city in order to place him under the care of his old physician. He remained here two or three months, most of the time in very low condition. There was great adhesion of the pleura, and he could use only about half of one lung. He returned to his home, and grew so much weaker that we all thought he would die. The pleura was tapped, and three quarts of water taken from it. He suffered so that we determined to send him to my brother's at Montrose, Pa., thinking that change of air might do him some good. The change was made last July. While at Montrose he suffered much from intense pain in the chest and suffocation. We gave him the best medical care that could be obtained. But it was of little avail. He wanted to go home to die.

"In this condition he was brought to New York, wrapped in shawls and blankets, for his feet were swollen and he could not get his boots on. I found him thus at the St. Cloud Hotel early in September.

"When my father's case had reached this point, I said to him and my mother and sisters: 'Now, you have all had your way as to medical treatment; suppose you let me have mine. I am a believer in Compound Oxygen. I want to try it on father.' They agreed to it, although they said his case was hopeless. We got a nurse from Bellevue Hospital. She said she knew nothing of Compound Oxygen, but would give it a fair trial.

"I went to my old friend, Dr. Turner, in charge of the New York office of Compound Oxygen, 148 Fifth Avenue. I told him my father's feet were badly swollen; that his breathing apparatus was all out of order; that his stomach was in bad condition from twenty years of dyspepsia, and that he was very low. The doctor said: 'I hope we can help him; we will try.'

"So I took a 'Home Treatment.' Father was so weak he could hardly inhale it at all. He could take the Oxygen in short whiffs. The nurse gave it to him ten or twelve times the first day. That night he slept, and it was the first good sleep he had taken for weeks. It was on a Tuesday that he began the Oxygen Treatment. By Saturday he was so much better that he wanted to leave the hotel and go to his home in Poughkeepsie. We lifted him along as gently as we could, and in a few hours he was sitting on his portico overlooking the Park and the Hudson River, and enjoying one of the most beautiful sunsets ever seen. Said he: 'The Lord has made this sunset especially for me. Now let me go to bed. I want to sleep.' He slept nearly all night, and with almost entire freedom from pain.

"A week ago I spent a day with him. I arrived about lunch time, and they gave my lunch in his room. When he saw it set out on a small table, he said: 'That's most appetizing. Why don't they give me my lunch that way? I'm tired of eating sick folks' dishes. I want some cold lamb and food like other folks.' Then he said that in order to eat solid food he must have his teeth fixed. He sent for a dentist, who took out three lower teeth and made him a new set. Why, if those teeth had been taken out before he began taking the Compound Oxygen, it would simply have killed him. Now he stood it bravely, and what is more, he is getting along handsomely with his new set, and eating pretty much what other people eat. His improvement has been marvelous. Formerly he could sleep only by resting his head forward on a chair placed for the purpose. Now he can lay his head back on his easy chair and sleep comfortably. Before he took the Oxygen he had not been in a bed for six weeks. Now he goes to bed every night, and obtains refreshing slumber. He walks about his room, and is sometimes taken out for a short drive. He takes Oxygen several minutes at a time, morning and night."

"Mr. Smillie, has your father's improvement been steady and regular, or has he had interruptions?"

"There have been occasional days of depression, and two or three times we have almost feared that he was going to lose all he had gained. But each of these depressing periods had been less than the previous one. I shall not be surprised if such periods return occasionally. It is natural in a man of his age that they should. But see the improvement! His breathing was obstructed, his stomach pain was great, his sleep was misery, and his skin was hard and dry. Now he breathes naturally, his stomach is free from distress, his sleep is refreshing, and his skin is like that of an infant. Let me remark that the use of the Oxygenaqua, which accompanies the Compound Oxygen, proved very advantageous for the relief of his stomach and bowels."

"Do you regard your father as an entirely well man?"

"As well as a man of seventy-eight can be who has passed through the experience he has. To renew the youth and heal all the infirmities of a man of his age would be an impossibility. But you see what Compound Oxygen has done for him. It has evidently prolonged his life. And it has performed wonders in easing him of pains which made life a burden."

"And now as to your own experience, Mr. Smillie? You must have had good reason for falling in love with Compound Oxygen to such an extent as to recommend it for your father."

"Four or five years ago I was badly overworked. I had been giving too close attention to business, and found myself breaking down. I procured a 'Home Treatment,' and diligently followed directions. It brought me up. Since then I have never been without it, and I never will be. My wife has been suffering from nervous prostration, and she is now taking Compound Oxygen with excellent results.

"I have a friend who, three summers ago, was suffering with a dreadful cough. 'That man can't live long,' said some of his friends who heard him cough. I persuaded him to go with me to the Compound Oxygen office. A few inhalations of Oxygen produced a marked effect on him. He had been almost sleepless at night. He soon began to enjoy restful sleep. All summer he kept on improving. In the fall his cough was gone. He is now as lively and hearty as any of us."

Is not this Compound Oxygen a wonderful thing? The doctors try to find out what it is made of. Mr. Smillie's physician asked for a vial from the "blue bottle" in order to analyze it. He reported that he couldn't tell what it was, but he was satisfied that it had done wonders for Mr. Smillie. Its whole history is the history of the accomplishments of wonders, which in many instances were more than its most sanguine believers had dared to hope for it. A little book which will be mailed free by Drs. STARKEY & PALEN, 1529 Arch Street, Philadelphia, tells much that is of value and interest concerning Compound Oxygen. Make free to write for it.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Bradley's improved Cushioned Helve Hammer. New design. Sizes, 25 to 500 lb. Bradley & Co., Syracuse, N. Y.

Light and Fine Machinery to order. Foot Lathe catalogue for stamp. E. O. Chase, Newark, N. J.

Curtis Damper Regulator for draught and steam pressure in boilers. Curtis Regulator Works, Boston, Mass.

Geo. E. Lloyd & Co., Electrotype and Stereotype Machinery, Folding Machines, etc. Send for catalogue. Chicago, Ill.

Notice to Manufacturers or Inventors.—A company with a large foundry, iron and woodworking machine shop in running order, located in one of the best towns in Ohio, not troubled with strikes, where coal, wood, and iron are cheap, would take any article made of iron or wood to make during the winter months, which is their dullest season of the year. Stoves or stove castings preferred. Address H. B. J., Lock Box 221, Columbus, O.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder*." A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty, St., New York.

Grimshaw.—Steam Engine Catechism. A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Coiled Wire Belting takes place of all round belting. Cheap; durable. C. W. Belting Co., 93 Cliff St., N. Y.

Air Compressors, Rock Drills. J. Clayton, 43 Dey st., N.Y.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Shafting, Couplings, Hangers, Pulleys. Edison Shafting Mfg. Co., 86 Goerck St., N.Y. Send for catalogue and prices.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky.

For Power & Economy, Alcott's Turbine, Mt. Holly, N.J.

Machinery for Light Manufacturing on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Send for descriptive circular on lubrication. Charles H. Besly & Co., North American Agents for Reisert's Celebrated Solid Oil, 175 & 177 Lake St., Chicago, Ill.

Keystone Steam Driller for all kinds of artesian wells. Keystone Driller Co., Limited, Box 32, Fallston, Pa.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Cutting-off Saw and Gaining Machine, and Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Cushman's Chucks can be found in stock in all large cities. Send for catalogue. Cushman Chuck Co., Hartford, Conn.

Crescent Steel Tube Scrapers are made on scientific principles. Crescent Mfg. Co., Cleveland, Ohio.

Curtis Pressure Regulator and Steam Trap. See p. 222.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 350.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Pays well on Small Investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusements. 136 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

The "Improved Green Engine," Automatic Cut-off. Providence Steam Engine Co., R. I., *Sole Builders.*

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

"*To Mechanics.*"—When needing Twist Drills, ask for "*Standard*," or send for catalogue to Standard Tool Co., Cleveland, O. See page xi., Export Edition.

Steel name stamps, 15 cts. per letter; steel figures, $1 per set. F. A. Sackmann, 1099 First Ave., Cleveland, O.

Seam and Looping Machines, patent Burr Wheels Brushing Machines. Tubbs & Humphreys, Cohoes, N. Y.

Machinists' Pattern Figures, Pattern Plates, and Letters. Vanderburgh, Wells & Co., 110 Fulton St., N. Y.

Astronomical Telescopes, from 6" to largest size. Observatory Domes, all sizes. Warner & Swasey, Cleveland, O.

NEW BOOKS AND PUBLICATIONS.

ELEMENTS OF INORGANIC CHEMISTRY, DESCRIPTIVE AND QUALITATIVE. By James H. Shepard. Boston: D. C. Heath & Co., 1885.

There is a marked tendency at present to make all education subjective. From the youngest baby who toddles to a kindergarten to the college senior nearing graduation, the successive steps are taken as far as possible by the student himself, and both text book and teacher become subordinate to his own faculties. In many respects the system is advantageous. The studies appear more absorbing than when viewed impersonally. There is, however, a danger that in limiting the investigation to one's own experience, the broader view of the subject, the underlying theory, may be lost. Mr. Shepard has recognized these tendencies, and in the present volume has attempted to avoid the disadvantages of too strict an adherence to either theory or practice by combining laboratory work with text book instruction from the very beginning. Systematic, experimental, and analytical chemistry are thus united in one volume, and are intended to be taught side by side. The method is unusual, for a student is seldom admitted to the laboratory until he has acquired some knowledge of elementary chemistry. It is well presented, and with a careful instructor could be expected to give good results. The grouping of the elements is made according to the reactions, as in strict analytical works, and arsenic and antimony find place therefore among the metals. The work has had the advantage of a careful revision by Dr. Ira Remsen.

PITTSBURG AND WESTERN PENNSYLVANIA. Issued by the Chamber of Commerce of Pittsburg, 1885.

Of late years, when rival towns are pressing their advantages upon the attention of manufacturers, a custom has grown up, among the various Chambers of Commerce of the competing points, of issuing pamphlets descriptive of the merits of their respective towns. It is a very good custom; for though these local bodies perhaps see more of the rose color about the smoke of the home atmosphere than other people would, their corporate standing is a guarantee of the integrity of the statements made; they offer also a convenient medium for further correspondence. The present brochure is a good example of its kind. A description is given of the main industries of Pittsburg and the natural facilities which aid their development, particular attention being of course devoted to the question of natural gas. An excellent map, showing the position of the oil fields and main gas wells, accompanies the monograph.

Natural gas: its advantages, use, and economies, by George H. Thurston, is a similar monograph having Tarentum as the subject of its eulogies. It is put forward evidently by the borough, and makes a strong appeal to the prospecting capitalist. Those investigating the economic advantages of Western Pennsylvania will find both of these pamphlets of interest.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) C. C. B. asks: Do you know of any remedy to prevent horses from wind or stump sucking and weaving? A. Both of the troubles mentioned by you are habits, and therefore not curable by any treatment other than care. The sucking habit may be prevented by tying a piece of sheepskin, woolly side out, over the posts, or by tying something around his throat to prevent swallowing. The other habit is incurable.

(2) S. R. asks for a receipt for making German paste for canary birds, small quantity. A. Blanched sweet almonds one pound, pea meal two pounds, butter three ounces, saffron a few grains, honey a sufficient quantity. Form the whole into a paste, and granulate it by pressing it through a colander. Some add the yolks of two eggs.

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(3) J. C. H. writes: 1. When I add tincture of cantharides to Horsford's acid phosphate, the mixture becomes cloudy. What are the reactions? A. The alcoholic extractive matter, insoluble in water, is naturally precipitated by the addition of an acid aqueous solution. 2. Is the phosphorus precipitated? A. The phosphorus is therefore not thrown down. 3. Are the medicinal properties of the ingredients changed? A. Not unless the extractive matter, which is precipitated, is removed, and also it depends upon what the compound is given for, whether it is impaired.

(4) H. W. H., Jr., writes: Some time ago I saw a very good method of assay of gold, a short process producing the metal from the ore to the pure state. Kindly say where I may find it. A. The detection of gold in a given mineral is a simple process, but the assay involves a determination of the amount of gold in the ore, and can only be satisfactorily accomplished by the collection of the metal in a lead button and subsequent cupellation of the same, as described in all text-books on the subject.

(5) H. M. asks (1) for means of restoring to its previous condition a painting done on white velvet, which was soiled by smoke, etc. A. We do not think that it is possible to remove the smoke without injury to the painting. 2. The method of cleaning steel engravings? A. Articles on "How to Restore Soiled Steel Engravings" are given in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 44, 115, and 124.

(6) C. M. McK. asks how will vulcanite a little less hard than that used for combs, brushes, etc., compare, under pretty rough treatment, with leather in durability? A. The vulcanite will not stand "pretty rough treatment." 2. About what proportion of sulphur would be used to obtain such a quality of vulcanite? A. For details as to manufacture see SCIENTIFIC AMERICAN SUPPLEMENT, No. 252. 3. Can you give me some idea of the cost of vulcanite in large quantities? A. The value of vulcanite is dependent upon its quality, and the price in accordance is from 30 cents to 75 cents.

(7) E. H. R. asks if the "white bronze" monuments retain their original color for an indefinite length of time. A. Yes. 2. Is the expansion or contraction of the metal by reason of heat or cold such as to be material, or worthy of consideration? A. No. 3. Does the white bronze, which I understand is zinc, wear well? A. Yes, it is very enduring. 4. My reasons for inquiry is, we are about getting up a soldiers' monument, and we want a good one. A. White bronze is excellent for the purpose you mention.

(8) J. H. asks the names of the ingredients composing the liquids in the various patent fire extinguishers, or a formula for a good liquid for the same. A. 8 pounds carbonate of soda, 4 pounds alum, 3 pounds borax, 1 pound carbonate of potash, and 24 pounds silicate of soda solution are mixed together; 1½ pounds of this mixture is added to each gallon of water when required for use. See also answer to query 7 in SCIENTIFIC AMERICAN for February 7, 1885.

(9) W. W. A. asks: Can I keep ice successfully with sawdust in a room 6 feet square and 8 feet high? The bottom is 6 feet below the ground, and is well drained. How thick should the sawdust be around it? A. Your plan is feasible. A layer of sawdust from 6 to 8 inches between double wood walls will be quite sufficient.

(10) H. L. K. asks (1) how sugar coated popcorn is prepared after the corn has been popped. A. The adhesive mixture with which the corns are held together consists of gelatine with a little molasses; the coloring matter is carmine.—We cannot undertake to give examples in simple arithmetic in these columns.

(11) F. E. asks: 1. Is there any book giving full information in regard to the manner of removing hair by electricity? A. There is no single book treating on this subject, and the practical success of this method can hardly be called proved. See the articles on Removal of Hair by Electricity contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 176 and 353. 2. Are there irido-platinum needles, manufactured for this purpose? A. No. 3. Is a one cell battery sufficient? A. No. 4. How is turtle shell softened, so that it may be given any desired shape? A. It is softened by the heat of boiling water; and if compressed in this state by screws in iron or brass moulds till it may be bent into any shape, the moulds being then plunged into cold water.

(12) J. W. V. asks: Is there any difference between the so-called "compound oxygen" used by some of the doctors, and the oxygen obtained by heating potassium chlorate and manganese? A. "Compound oxygen" is simply a fancy name given to an article made and sold by various physicians throughout the country. In the May issue of the *Druggists Circular*, the analyses of five articles bearing the name of compound oxygen are given. 2. Is the latter ever used for medicinal purposes? A. Under certain circumstances, it is probably used for inhalation. 3. How are paper mustard plasters made? A. They are probably made by dipping porous paper in a strong alcoholic extract of oil of mustard. After it has dried, it may be applied.

(13) C. R. C. writes: An eight day clock spring ¾ inch in width would be equal to a weight of how many pounds as to power? A. Clock springs are not always of the same power for the same width. You can only ascertain by trial of a given spring.

(14) E. C. & J. E. Y.—For stove cement use pulverized clay 8 parts, fine iron filings 4 parts, peroxide of manganese 2 parts, sea salt 1 part, borax 1 part. Thoroughly pulverize, dry, and mix. When required for use, make up the required quantity for immediate use into a thick putty with water.

(15) C. E. A. asks the simplest way to melt small quantities of gold, silver, copper, etc., also if platinum can be melted in the same manner. A. The simplest method of melting gold, silver, copper, etc., is by treating them with a little carbonate of soda on a piece of charcoal, and then fusing with a blowpipe. Platinum requires a much higher heat, and is infusible by the ordinary processes.

(16) B. writes: I can buy a good second hand portable 12 horse power boiler and engine for the same price I can a 5 horse power of same style. I wish to put an engine in my barn for steam purposes generally, such as cutting forage, firewood, etc., but do not need over 5 horse power. Which of these two engines is preferable for me? Will the 12 horse power be as economical as the five horse power in doing the same work? In my inexperience, it appears that a 12 horse engine doing half work is as economical as a 5 horse power at its full power. Is it? A. We recommend the 12 horse power engine, which will do your work at half the boiler pressure; and, if your boiler is in proportion, will not only give you economical results, but will be a source of satisfaction if you should afterward need more power or wish to sell.

(17) M. C. C. asks: What chemical is used in annealing malleable iron castings, and in what proportion? A. Pulverized hematite or pulverized anvil scales. The goods to be packed in cast iron boxes so that each piece shall be surrounded with the above material. The whole to be placed in an oven and heated redhot, and remain so for from 2 to 4 days.

(18) G. M.—The bluing of gun barrels is done by heating evenly in a muffle until the desired blue color is raised—the barrel being first made clean and bright with emery cloth, leaving no marks of grease or dirt upon the barrel when the bluing takes place. We do not recommend this except in the hands of experts. It requires considerable experience to obtain an even, clear blue. The receipt for browning is from the United States Ordnance Manual, and is as follows: Spirits of wine 1½ ounces, tincture of steel 1½ ounces, corrosive sublimate 1½ ounces, sweet spirits of niter 1½ ounces, blue vitriol 1 ounce, nitric acid ¾ ounce. Mix, and dissolve in 1 quart of warm water, and keep in a glass jar. Clean the barrel well with caustic soda water to remove grease or oil. Then clean the surface of all stains and marks, by emery paper or cloth, so as to produce an even bright surface for the acid to act upon. No finger marks. Stop the bore and vent with wooden plugs. Then apply the above mixture to every part with a sponge or rag, expose to the air for twenty-four hours. Then rub the loose rust off with a steel scratch brush. Again apply the mixture and scratch brush, and if not perfect, a third time. If satisfactory, wash in boiling water, dry quickly, and wipe with linseed oil or varnish with shellac.

(19) R. G. W. asks (1) how to gold, silver, and nickel plate small things. I have a powerful battery of zinc and carbon and sulphuric acid and bichromate of potash. A. For information on electroplating we refer you to SUPPLEMENT, No. 310. You will not require a battery giving a high tension current for electroplating. 2. Which can be burnt the harder—a hard pressed brick or one that is not pressed very hard? A. So far as the hardening of the clay is concerned, one brick will be as hard as the other; but the pressed brick will be more dense, and will consequently stand more pressure.

(20) F. R. H. asks: Will you give me in your valuable paper a little advice as to the use of melted paraffine as a means of protecting metal (tools, implements, etc.) from rust, damp, and salt air? Here in Florida I have great trouble with such things as guns, carpenters' tools, machinery, and hardware in the house rusting, and have heard a good deal of talk about paraffine. A. You can obtain paraffine from any of the wholesale druggists in New York city, who will give you prices on application. It comes in irregular fragments or in cakes; you can apply it to the metal surfaces by warming the metal and rubbing the paraffine on, allowing it to melt, or you can dissolve the paraffine in benzole or naphtha, and apply it as a varnish.

(21) D. G. E. asks: Why will a long horsehair stretched in an Æolian harp produce a sound, when a shorter one, blown upon with a current of air from the mouth, will not? Are there any peculiar conditions in which strings produce sounds by such means? A. There is no reason why the Æolian harp effect cannot be produced by the breath, if the conditions are favorable; probably one reason why you did not succeed in your experiment is that your string was so short as to produce vibrations too rapid for a musical note.

(22) J. B. S. writes: Please send me the directions for using the Reis telephone, or let me know in what number of your paper, if in any, I can find an explanation of the same. A. Reis' telephone may be used successfully by substituting carbon for the platinum points. It may be made to transmit speech by a careful adjustment of the platinum points, but it is not practical when used in that way. Some experimenters have placed between the contact points of the transmitter a liquid such as acidulated water, thereby improving the effect. For description of Reis' telephone, see SUPPLEMENT, No. 389.

(23) F. A. H. writes: To-day a man came in my office with a small glass tube with two round globes on each end, each as large as an egg. The tube connecting the two bulbs was some 8 or 10 inches in length. They were about half full of a red, blood-looking fluid. By holding one bulb in the hand, for some persons, the fluid would rush to the other bulb, although the other bulb was much higher than the one in hand; for others, the fluid would not move. It was claimed by the man that had it that it was operated by the blood; a person having good blood would cause it to flow almost perpendicular into the upper chamber, while a person with poor blood would not move it. As I had never seen anything of the kind before, I was much surprised. Will you kindly explain in Notes and Queries the science of this instrument, what the fluid is, and why it operates? A. The tube and bulbs contain ether colored by aniline. The air is exhausted from the bulbs, so that the ether boils at a very low temperature, the heat of the hand being sufficient to vaporize it rapidly. The quality of the blood of the person handling the instrument has nothing whatever to do with the action of the ether.

(24) R. L. asks: 1. Would not brass wire do for winding field magnets of electric machine described in SUPPLEMENT, No. 161? A. Brass wire will not answer so well as copper wire, because its electrical conductivity is considerably less than that of copper. 2. Would not paper covered wire do? A. Paper covered wire would do, provided you could wind it without breaking the insulation. The paper covering should be very thin and strong. 3. What would machine be worth complete? A. Such machines may be purchased for from $40.00 to $50.00.

COMMUNICATIONS RECEIVED.

On Clinical Thermometers. By C. E. W.
On the Fly's Foot. By C. H. L.

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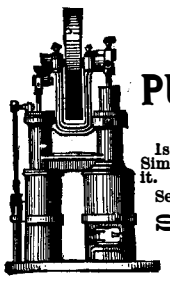

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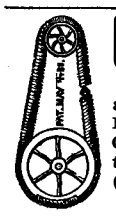

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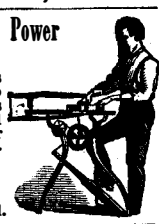

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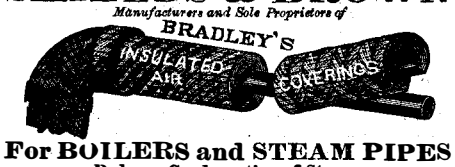

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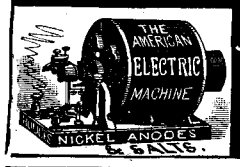

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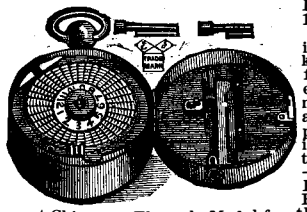

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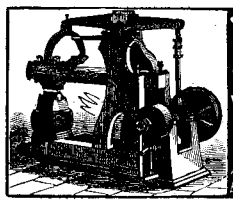

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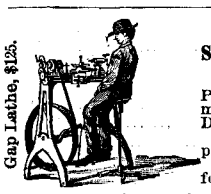

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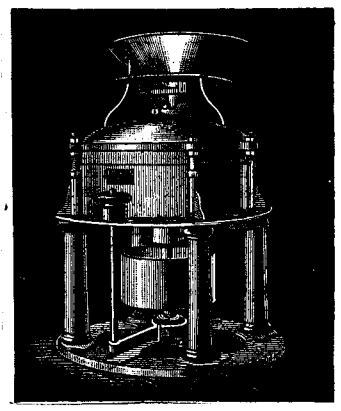

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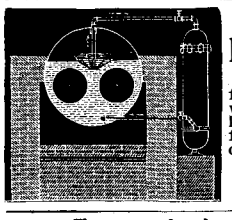

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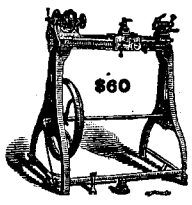

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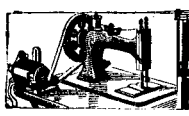

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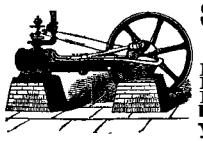

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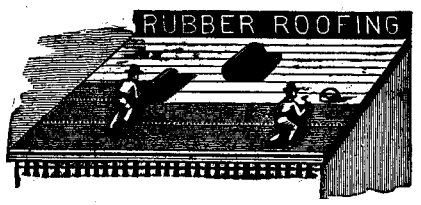

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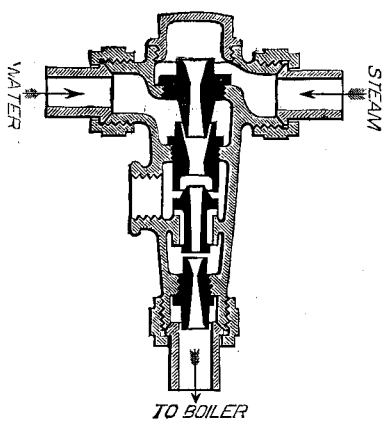

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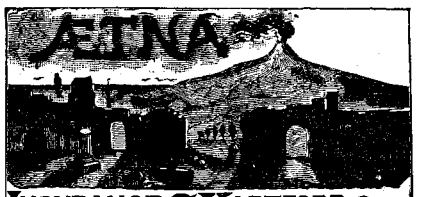
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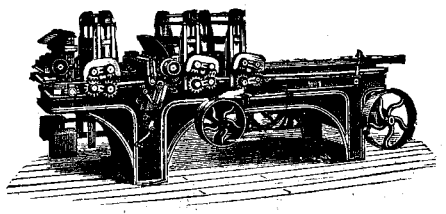

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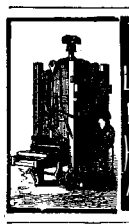

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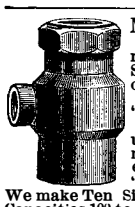

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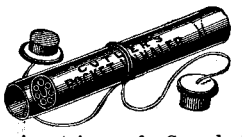

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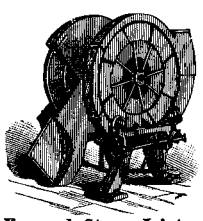

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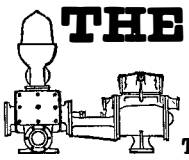

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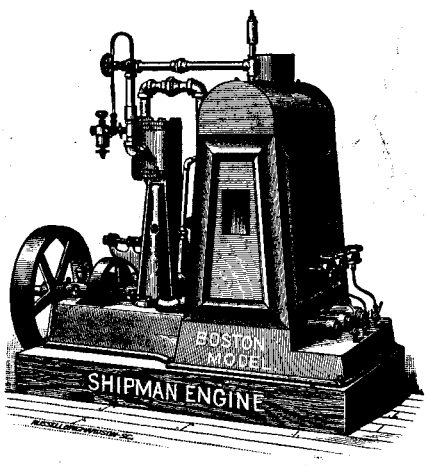

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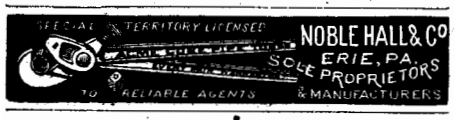

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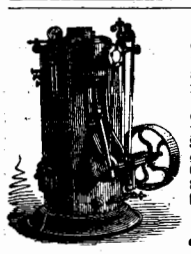

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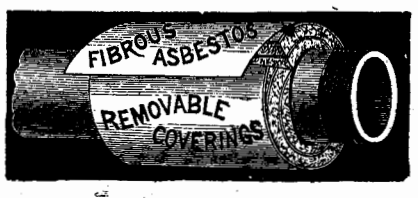

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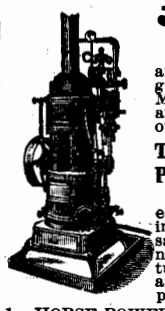

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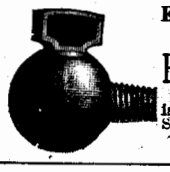

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